Allen-Bradley

ControlLogix™ System

1756-L1, -L1Mx, -L55Mxx, -L63

User Manual

Rockwell Automation

File Name: AB_ControlLogix_1756_L1_L1Mx_L5Mxx_L63_user_D1101

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WARNING

Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

Introduction

This release of this document contains new and updated information. To find new and updated information, look for change bars, as shown next to this paragraph.

Updated Information

The document contains the following changes:

This new or updated information:	Starts on page:
Communicate with an RSView Project over an EtherNet/IP Network	7-1
Communicate with 1771 I/O Over a ControlNet™ Network	9-1
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Notes:

Purpose of this Manual

This manual guides the development of projects for ControlLogix controllers. It provides step-by-step procedures on how to establish communications:

- over the following networks
  - EtherNet/IP
  - ControlNet™
  - remote I/O
  - DH+™
  - DH-485
  - serial
- with the following devices
  - controllers
  - I/O
  - workstations
  - PanelView™ terminals

This manual works together with the *Logix5000 Controllers Common Procedures*, publication 1756-PM001, which covers the following tasks:

- Manage project files
- Organize your logic
- Organize tags
- Program routines
- Test a project
- Handle faults

Who Should Use this Manual

This manual is intended for those individuals who program applications that use ControlLogix controllers, such as:

- software engineers
- control engineers
- application engineers
- instrumentation technicians

When to Use this Manual

Use this manual:

- when you are ready to integrate your application with the I/0 devices, controllers, and networks in your system.
- *after* you perform these actions:
  - develop the basic code for your application
  - perform isolated tests of your application

How to Use this Manual

This manual is divided into the basic tasks that you perform while programming a ControlLogix controller.

- Each chapter covers a task.
- The tasks are organized in the sequence that you will typically perform them.

As you use this manual, you will see some terms that are formatted differently from the rest of the text:

Text that is:	Identifies:	For example:	Means:
Italic	the actual name of an item that you see on your screen or in an example	Right-click *User-Defined* …	Right-click on the item that is named User-Defined.
`courier`	information that you must supply based on your application (a variable)	Right-click *`name_of_program`* …	You must identify the specific program in your application. Typically, it is a name or variable that you have defined.

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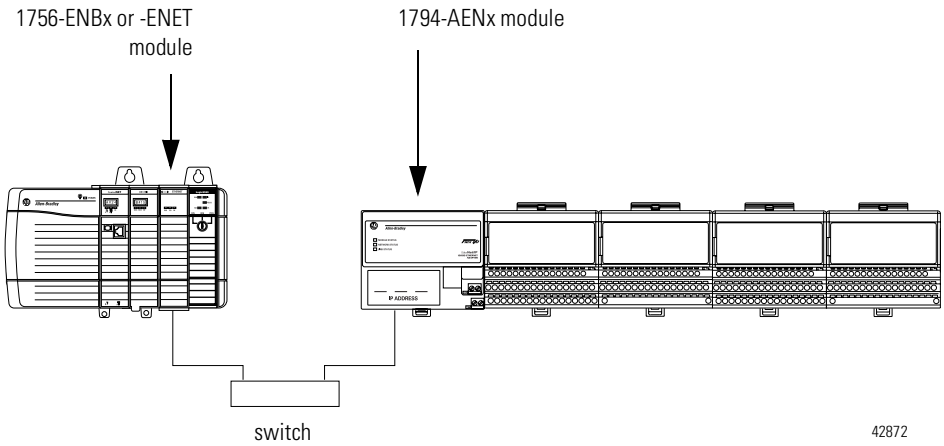
Configure an EtherNet/IP Module

When to Use This Procedure

Use this procedure to configure any of the following modules:



You can configure a module either:

- before you install the module
  - Configure the module in a temporary location, such as a chassis that is on a test bench.
  - After you configure the module, install it in your system.
- after you install the module in your system

Before You Begin

The configuration of an EtherNet/IP module includes:

- IP address (required)
- subnet mask (recommended)
- gateway address (optional)
- domain name (optional)
- DNS server addresses (optional)

You use software to configure an EtherNet/IP module. (The modules *do not* have hardware switches to assign an address.) To configure a module, use one of these software:

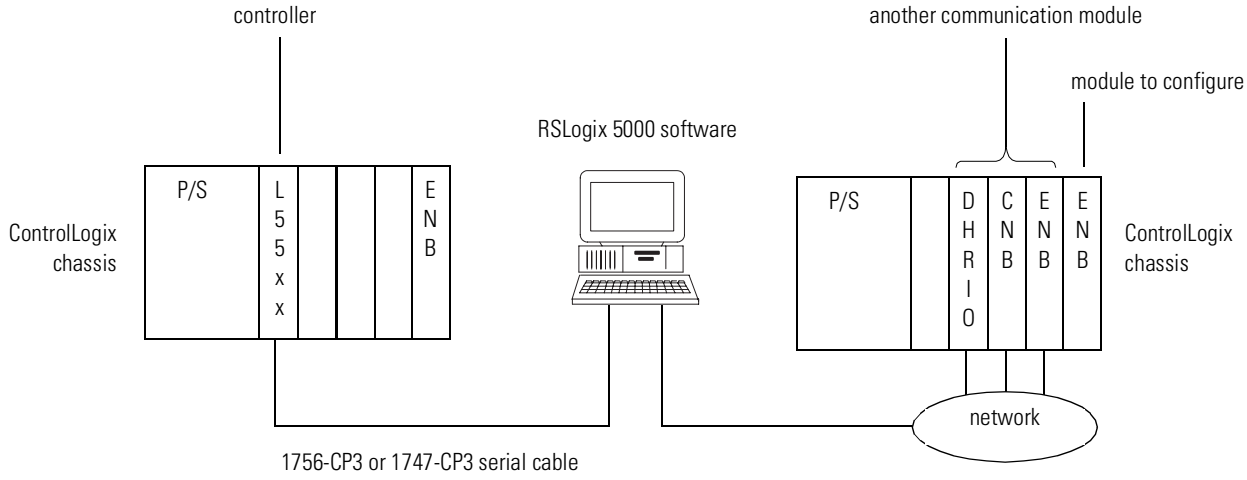
- RSLogix 5000 Software
- RSLinx Software
- BOOTP Server Software

To determine which software lets you configure your module, use the following table:

To configure this module:	Use one of these software:		
	RSLogix 5000	RSLinx	BOOTP server
1756-ENBx	✔	✔	✔
1756-ENET	✔	✔	✔
1794-AENx			✔

RSLogix 5000 Software

RSLogix 5000 software lets you configure a 1756-ENBx or -ENET module via another module that is in the chassis.



Use RSLogix 5000 software to assign:

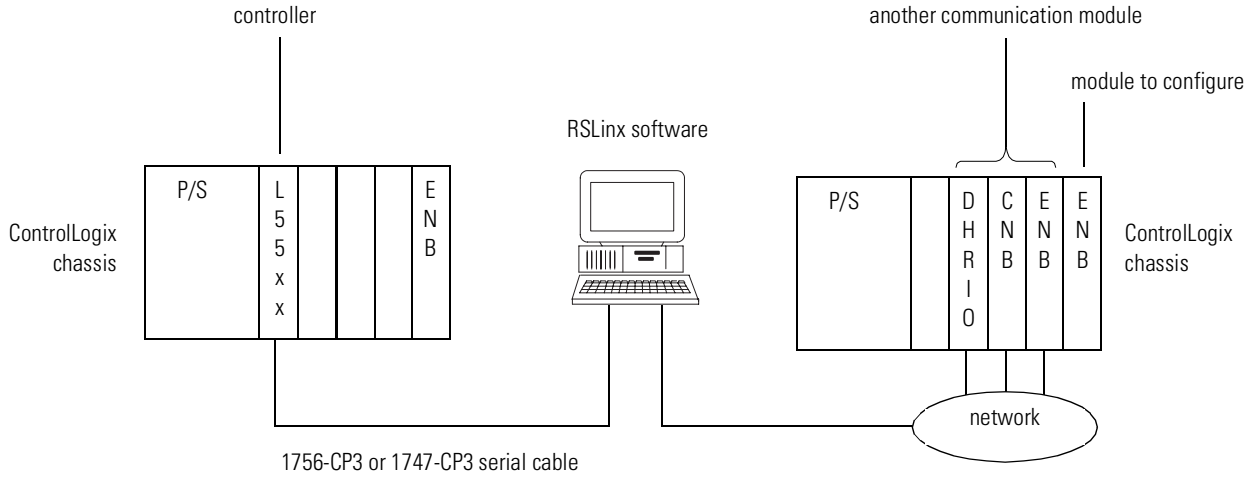
- IP address (required)
- subnet mask (recommended)
- gateway address (optional)
- domain name (optional)
- DNS server addresses (optional)

When you configure a module with RSLogix 5000 software, you enter an IP address or host name in two locations:

On this tab:	You:
General (first screen of the Module Properties wizard)	Identify the module on the EtherNet/IP network with which you want to connect
Port Configuration	Assign configuration information to the module, such as its IP address. This information is stored in the module and identifies the module on the EtherNet/IP network.

RSLinx Software

RSLinx software lets you configure a 1756-ENBx or -ENET module via another module in the chassis.



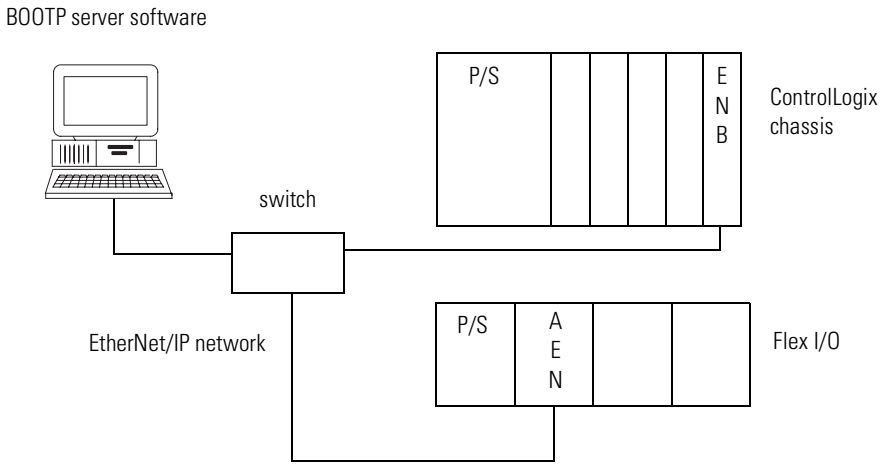
Use RSLinx software to assign:

- IP address (required)
- subnet mask (recommended)
- gateway address (optional)
- domain name (optional)
- DNS server addresses (optional)

BOOTP Server Software

To configure a module over an EtherNet/IP network, use any of the following BOOTP server software:

- BOOTPServer software from Rockwell Automation
- any BOOTP server software that is commercially available



The default setting for a Rockwell Automation EtherNet/IP module is to use BOOTP to get its configuration information.

- At power-up, the module sends a message with its hardware address to the BOOTP server.
- The BOOTP server sends the appropriate configuration to the module.

The BOOTPServer software from Rockwell Automation lets you assign:

- IP address (required)
- subnet mask (recommended)
- gateway address (optional)

How to Use This Procedure

Use the following table to find the information that you need:

If you have this module:	And you want:	Then:	See page:
1756-ENBx 1756-ENET	configure the module via another module that is in the chassis (e.g., controller, 1756-CNB, 1756-DHRIO)	Configure a Module Using RSLogix 5000 Software or Configure a Module Using RSLinx Software Note: Both software let you configure the module. Use the one that you prefer.	1-7 1-13
	configure the module directly over an EtherNet/IP network	Configure a Module Using BOOTP	1-16.
1794-AENx	configure the module	Configure a Module Using BOOTP	1-16.
	re-establish communication because either: • The configuration of the module is incorrect for your network. • You do not know the IP address of the module.	Renew the IP Address of a 1794-AENx Module	1-20.
any	make sure that you can communicate with the module	Test the Configuration	1-24.

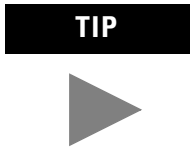
Configure a Module Using RSLogix 5000 Software

To configure a module using RSLogix 5000 software:

- Connect the Hardware
- Connect to the Module
- Configure the Port
- Check the Module

Connect the Hardware

1. Install the module.
2. Connect your computer to a module with which you can already communicate. The module must be in the same chassis as the module that you want to configure.

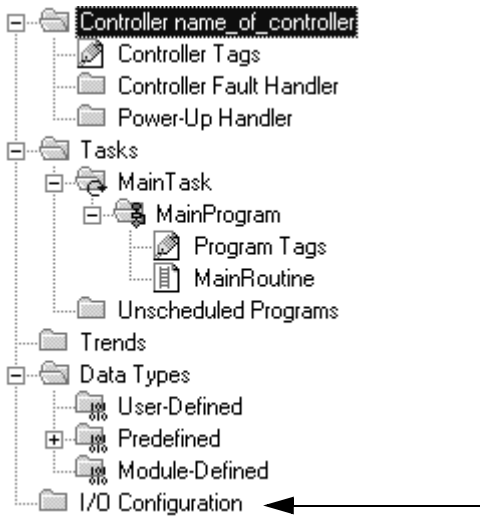


To set up communication between your computer and a controller, see "Connect Directly to a Controller" on page 1-24.

3. Turn on the power to the module.

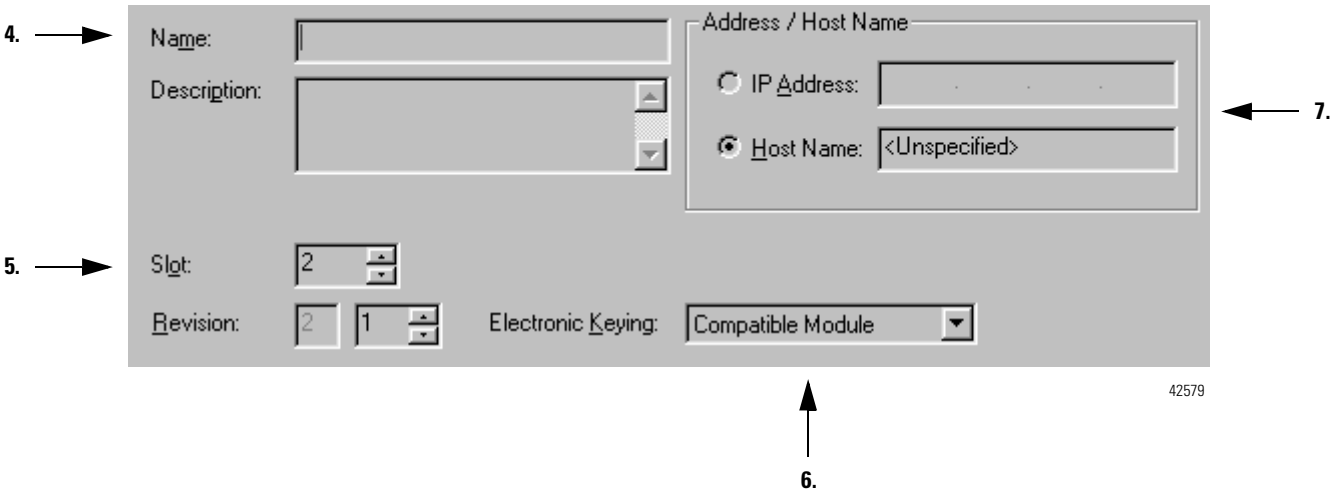
Connect to the Module

1. Open the RSLogix 5000™ project offline.



2. Right-click *I/O Configuration* and select *New Module*.

3. Select your type of ENB or ENET module and choose *OK*.



4. Type a name for the module.

5. Type or select the slot number where the module is installed.

6. How closely must any module that is installed in this slot match the information on this tab?

If:	Then select:	Notes:
all information must match: • type • catalog number • vendor • major and minor revision number	*Exact Match*	
all information *except* the minor revision number	*Compatible Module*	If you select *Compatible Module*, you can still replace a 1756-ENET/B module with a 1756-ENBT module. However, you *cannot* replace an ENBT module with an ENET/B module.
no information must match	*Disable Keying*	

7. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	A. Select the *IP Address* button. B. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

8. Click *Finish*.

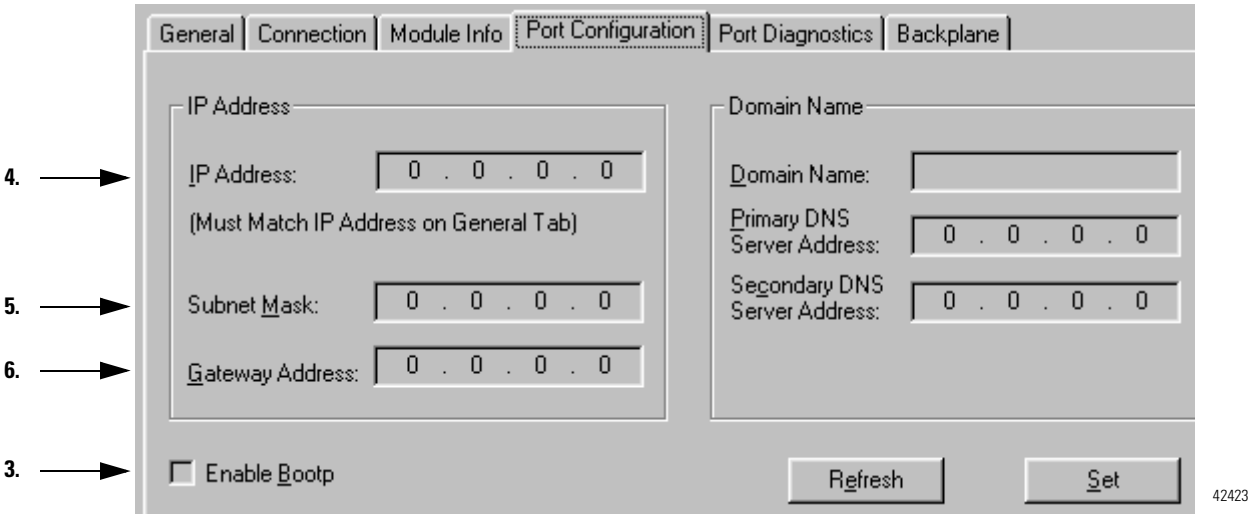
9. From the *File* menu, choose *Save*.

10. Download the project to the controller.

Configure the Port

1. In the controller organizer, right-click the ENB or ENET module and select *Properties*.

2. Click the *Port Configuration* tab.



3. Clear (uncheck) the *Enable Bootp* check box.

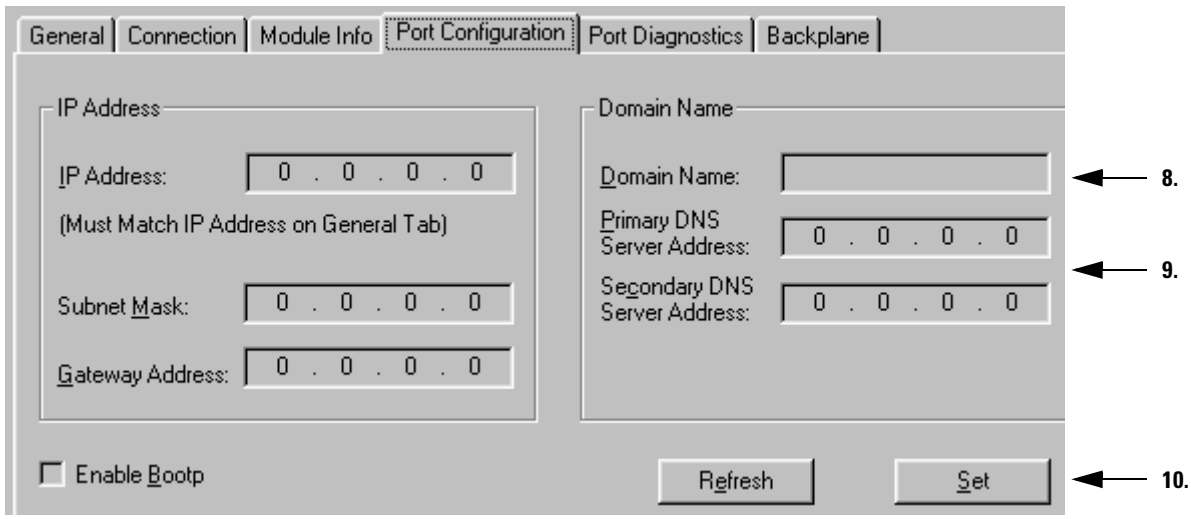
4. Type the IP address of the module.

5. Type the subnet mask for the module, if you need one.

6. Type the gateway address for the module, if you need one.

7. Will you use host names to specify other EtherNet/IP devices? (I.e., When you send a message or configure a remote ENB or ENET module, will you use a host name instead of an IP address?)

If:	Then:
Yes	Go to step 8.
No	Go to step 10.



8. .Type the name of the domain of the module.

9. Type the IP address of the server or servers that contain the DNS database for the domain.

10. Choose *Set*.

A dialog box asks you to confirm your changes.

11. To apply your changes, choose *OK*.

12. To close the Module Properties dialog box, choose *OK*.

Check the Module

To make sure that this procedure was successful, look at the front of the module:

For this module:	Check this indicator:	For this indication:
1756-ENET	OK LED	solid green
1756-ENBx	four character display	IP address of the module

Configure a Module Using RSLinx Software

To configure a module using RSLinx software:

- Connect the Hardware
- Configure the Port
- Check the Module

Connect the Hardware

1. Install the module.
2. Connect your computer to a module with which you can already communicate. The module must be in the same chassis as the module that you want to configure.

TIP

To set up communication between your computer and a controller, see "Connect Directly to a Controller" on page 1-24.

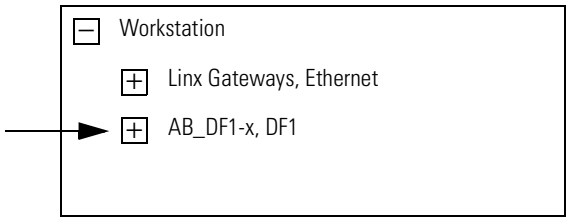
3. Turn on the power to the module.

Configure the Port

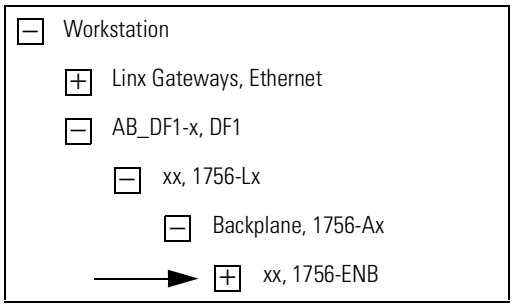
1. Start RSLinx software.

To expand a network one level, do one of the following:

- Double-click the network.
- Select the network and press the → key.
- Click the + sign.

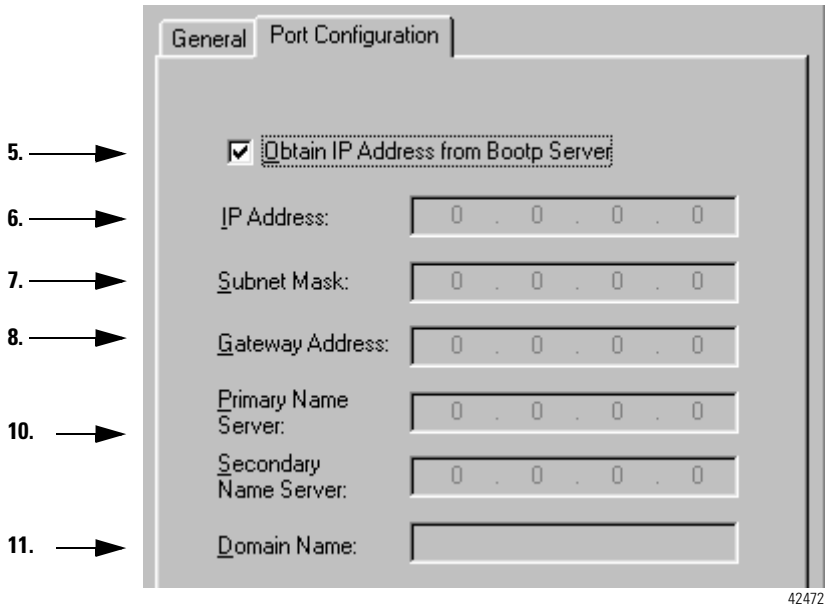


2. Expand a network until you see the module.



3. Right-click the module and choose *Module Configuration*.

4. Click the *Port Configuration* tab.



5. Clear (uncheck) the *Obtain IP Address from Bootp Server* check box.

6. Type the IP address for the module.

7. Type the subnet mask for the module, if you need one.

8. Type the gateway address for the module, if you need one.

9. Will you use host names to specify other EtherNet/IP devices? (I.e., When you send a message or configure a remote ENB or ENET module, will you use a host name instead of an IP address?)

If:	Then:
Yes	Go to step 10.
No	Go to step 12.

10. Type the IP address of the server or servers that contain the DNS database for the domain.

11. Type the name of the domain of the module.

12. Choose *OK*.

Check the Module

To make sure that this procedure was successful, look at the front of the module:

For this module:	Check this indicator:	For this indication:
1756-ENET	OK LED	solid green
1756-ENBx	four character display	IP address of the module
1756-AENx	NETWORK STATUS	flashing green or steady green

Configure a Module Using BOOTP

To configure a module using BOOTP software:

- Install BOOTPServer Software
- Connect the Hardware
- Enter the Default Network Settings
- Configure the Module
- Disable BOOTP
- Save the Relation List

Install BOOTPServer Software

This procedure requires BOOTPServer software from Rockwell Automation. You can find the software at either of these locations:

- RSLogix 5000 software CD, *ENU \ TOOLS \ BootP Utility* folder, *BootPServer.exe*
- www.ab.com\networks

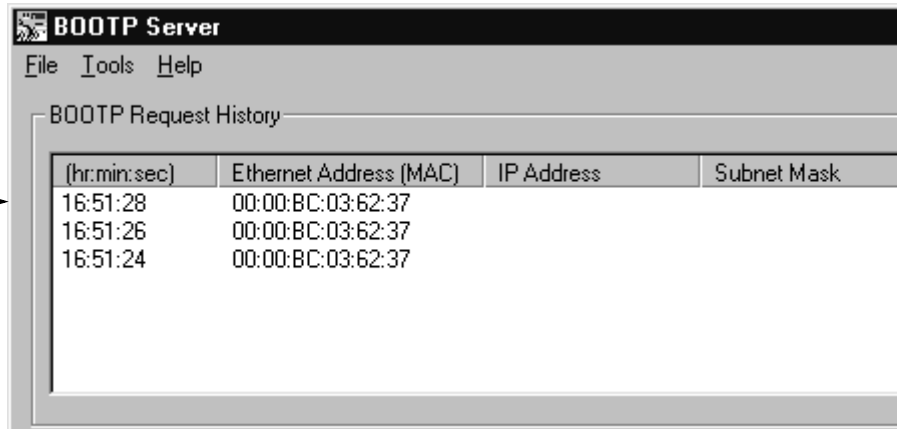
Connect the Hardware

1. Install the module.
2. Connect the module to the network.
3. Turn on the power to the module.
4. Connect your computer to the same network subnet as the module.

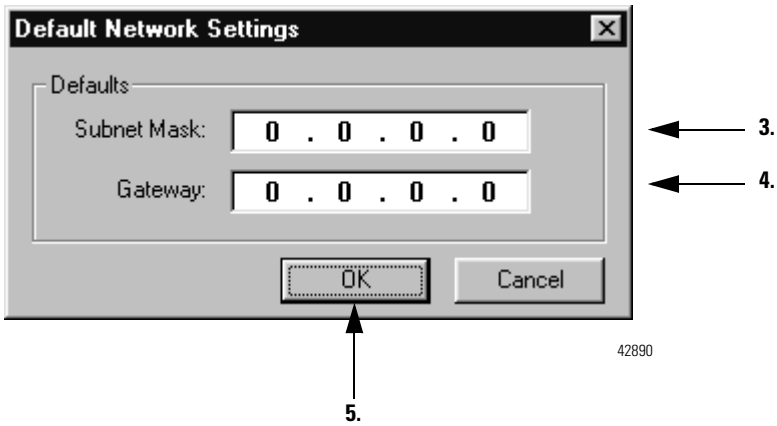
Enter the Default Network Settings

1. Start the BOOTPServer software.

The module sends its Ethernet address to the BOOTP server on a regular basis.



2. From the *Tools* menu, choose *Default Network Settings*.

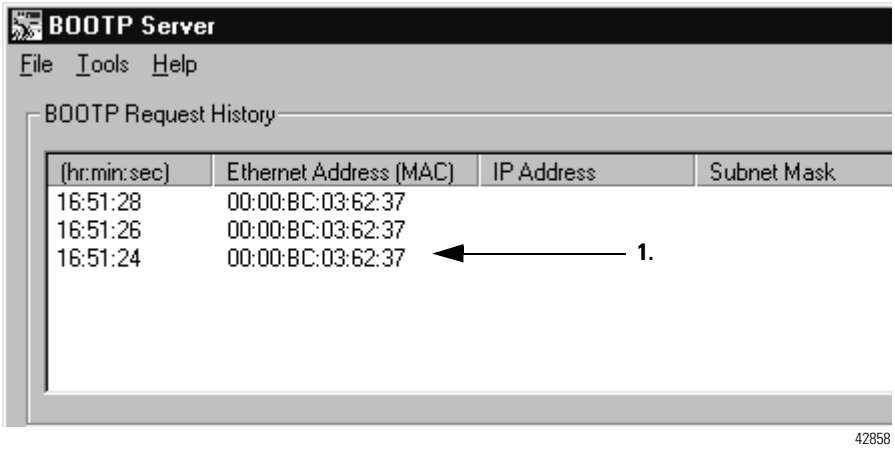


3. Type the subnet mask for the module, if you need one.

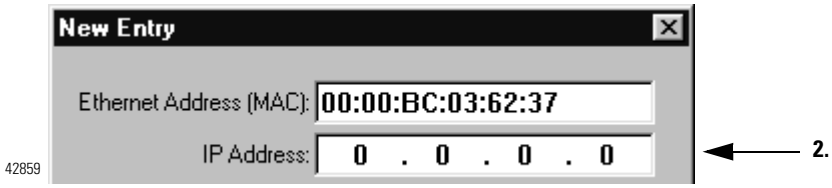
4. Type the gateway address for the module, if you need one.

5. Choose *OK*.

Configure the Module



1. Double-click the address of the module.

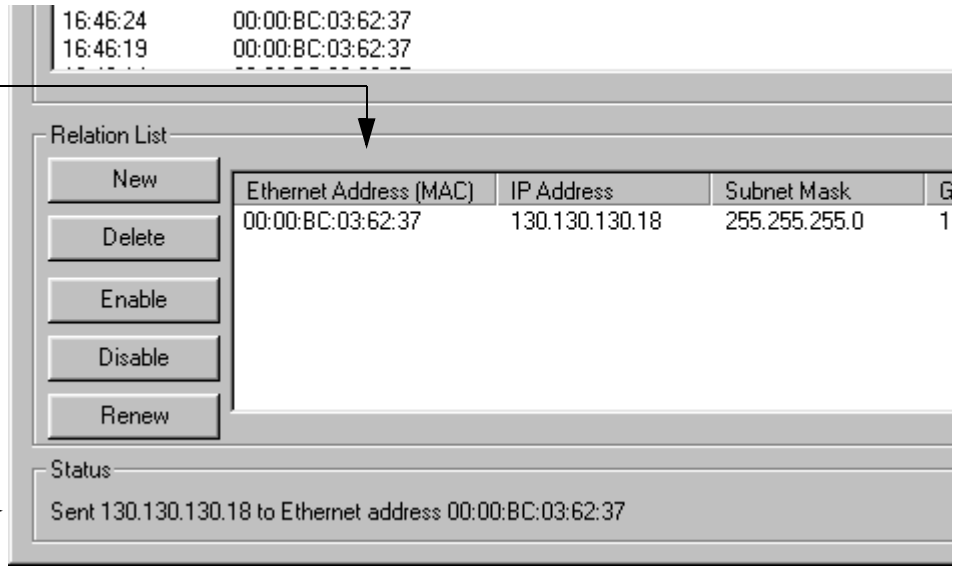


2. Type the IP address for the module.

3. Choose *OK*.

The module shows up in the Relation List.

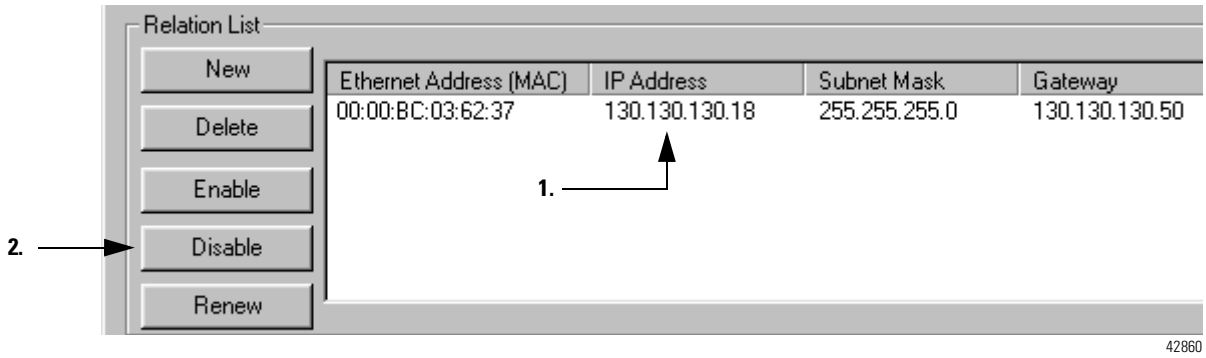
The status line shows that the software sent the address to the module.



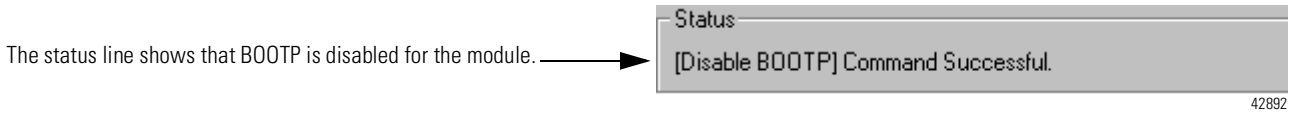
Disable BOOTP

Each time you turn on the module, what do you want it to do?

If you want the module to:	Then:	Notes:
Use the same configuration	Go to step 1.	This disables BOOTP for the module. It no longer requests a configuration from BOOTP servers.
Request a configuration from a BOOTP server	Go to "Save the Relation List" on page 1-19.	• This leaves BOOTP enabled for the module. When you turn off the module, it loses its configuration information. • Use this option only when a BOOTP server is continually available to configure the module..



1. In the *Relation List*, select the module.
2. Choose *Disable*.



Save the Relation List

The relation list contains the configuration that you have just sent to a module. You can use it as a record of the configuration of each module or to re-configure the module in the future.

1. From the *File* menu, choose *Save Relation List*.
2. Type or select a file name.
3. Choose *Save*.

Renew the IP Address of a 1794-AENx Module

To renew (reset) the IP address of a 1794-AENx module:

- Install BOOTPServer Software
- Set Up the Hardware
- Enter the New Configuration
- Send the Configuration
- Disable BOOTP
- Save the Relation List

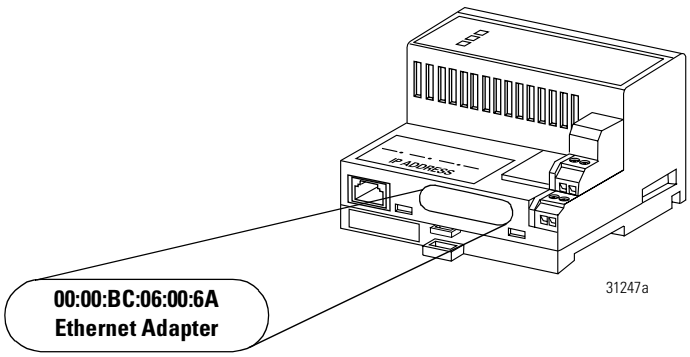
Install BOOTPServer Software

To renew the IP address of a 1794-AENx module, use BOOTPServer software from Rockwell Automation. You can find the software at either of these locations:

- RSLogix 5000 software CD, *ENU \ TOOLS \ BootP Utility* folder, *BootPServer.exe*
- www.ab.com\networks

Set Up the Hardware

1. Cycle the power to the module.

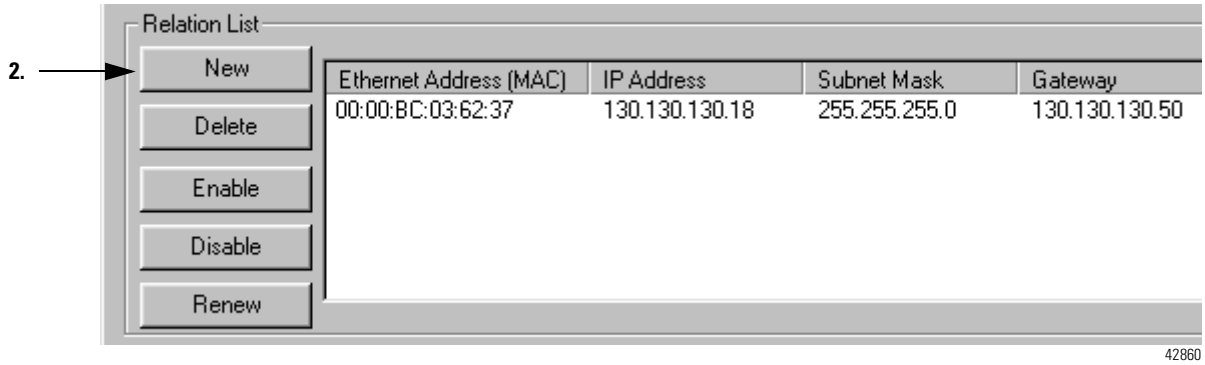


2. Write down the Ethernet address of the module.

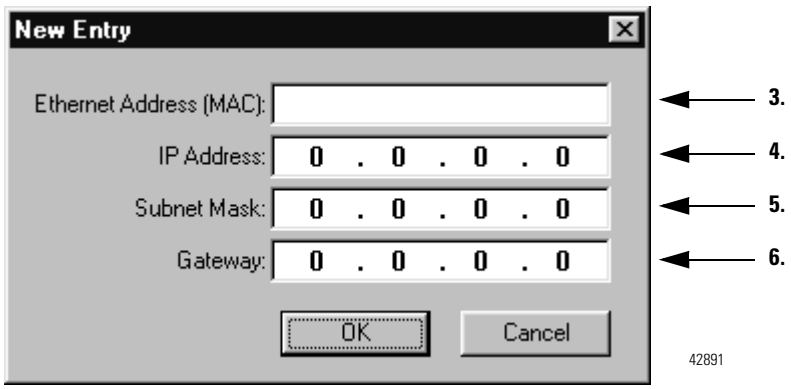
3. Connect your computer to the same network subnet as the module.

Enter the New Configuration

1. Start the BOOTPServer software.



2. Choose *New*.



3. Type the Ethernet address of the module (e.g., 00:00:BC:06:00:6A).

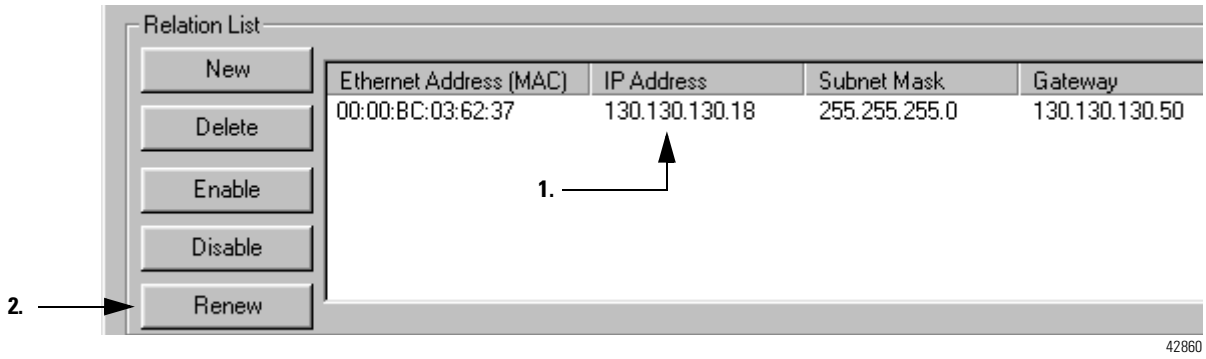
4. Type the IP address for the module.

5. Type the subnet mask for the module, if you need one.

6. Type the gateway address for the module, if you need one.

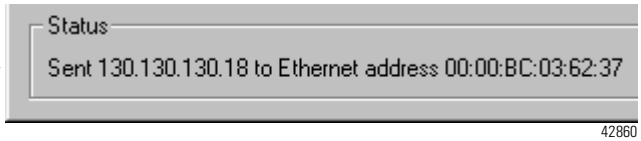
7. Choose *OK*.

Send the Configuration



1. In the *Relation List*, select the module.
2. Choose *Renew*.

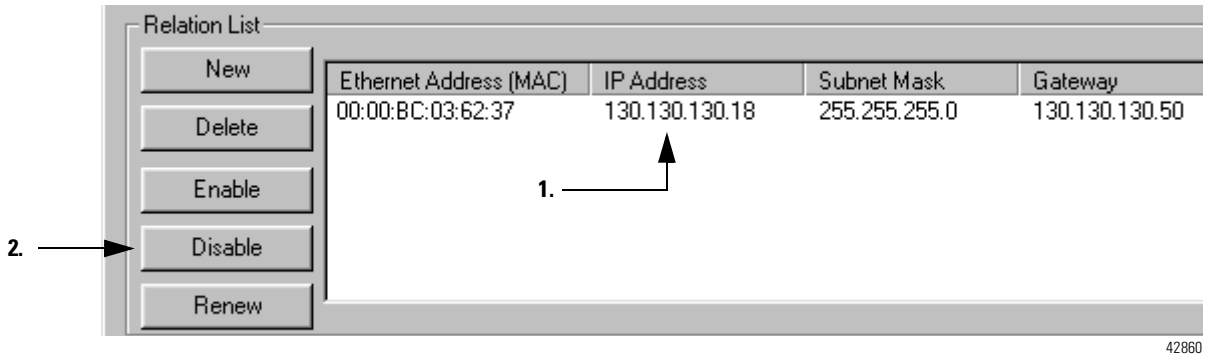
The software resets the module and sends the new IP address.



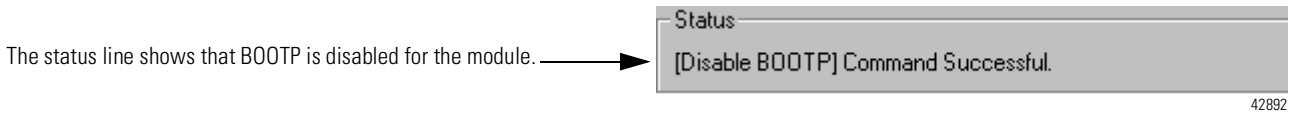
Disable BOOTP

Each time you turn on the module, what do you want it to do?

If you want the module to:	Then:	Notes:
Use the same configuration	Go to step 1.	This disables BOOTP for the module. It no longer requests a configuration from BOOTP servers.
Request a configuration from a BOOTP server	Go to "Save the Relation List" on page 1-23.	• This leaves BOOTP enabled for the module. When you turn off the module, it loses its configuration information. • Use this option only when a BOOTP server is continually available to configure the module..



1. In the *Relation List*, select the module.
2. Choose *Disable*.



Save the Relation List

The relation list contains the configuration that you have just sent to a module. You can use it as a record of the configuration of each module or to re-configure the module in the future.

1. From the *File* menu, choose *Save Relation List*.
2. Type or select a file name.
3. Choose *Save*.

Test the Configuration

1. If you have not already done so:
   a. Connect the module to the network.
   b. Connect your computer to the same network subnet as the module.
2. From the Windows NT *Start* menu, select *Programs* → *Command Prompt*.
3. Type `ping IP_address` and press the *Enter* key.

   where:

   `IP_address` is the IP address of the module.
4. Did you receive a reply from the module?

If:	Then:
Yes	You have a valid configuration for the module.
No	Check your configuration.

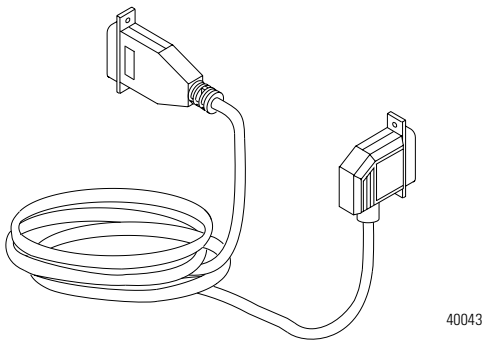
5. Close the Command Prompt window.

Connect Directly to a Controller

To set up communications between your computer and a controller:

- Connect a Serial Cable
- Configure a Serial Driver

Connect a Serial Cable

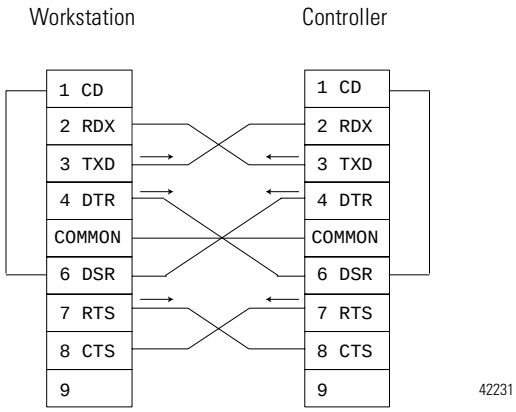


1. Obtain a 1756-CP3 serial cable. (You can also use a 1747-CP3 cable from the SLC product family, but once the cable is connected you cannot close the controller door.)

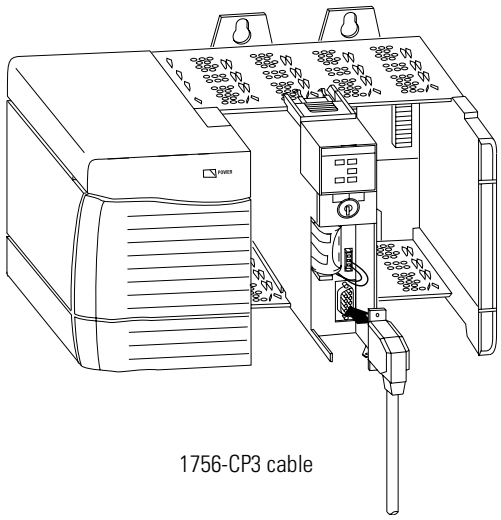
TIP

If you make your own serial cable:

- Limit the length to 15.2m (50 ft).
- Wire the connectors as follows:



- Attach the shield to both connectors.



2. Connect the cable to the controller and to your workstation.

Configure a Serial Driver

1. Start RSLinx™ software.
2. From the *Communications* menu, select *Configure Drivers*.
3. From the *Available Driver Types* list, select *RS-232 DF1 Devices*.
4. Click *Add New*.
5. Click *OK* to accept the default name for the driver.
6. From the *Comm Port* drop-down list, select the serial port (on the workstation) that the cable is connected to.
7. From the Device drop-down list, select *Logix 5550-Serial Port*.
8. Click *Auto-Configure*.
9. Does the dialog box display the following message:

   Auto Configuration Successful!

If:	Then:
Yes	Click *OK*.
No	Go to step 6. and verify that you selected the correct Comm Port.

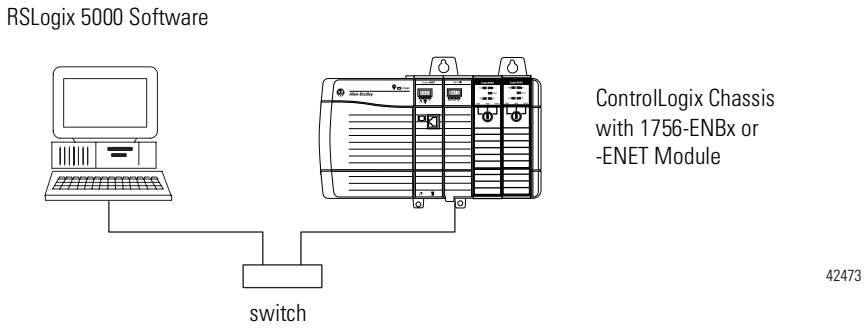
10. Click *Close*.

Download and Go Online over an EtherNet/IP Network

When to Use This Procedure

Use this procedure when you want to perform any of the following over an EtherNet/IP network:

- download a project
- go online and monitor a controller
- upload a controller



How to Use This Procedure

IMPORTANT Before you use this procedure, configure the 1756-ENBx or -ENET module that is in the chassis with the controller. Refer to "Configure an EtherNet/IP Module" on page 1-1.

To complete this procedure, do the following tasks:

- Configure an Ethernet Driver
- Select a Path

Configure an Ethernet Driver

In this task, you configure an RSLinx driver to communicate with devices on an EtherNet/IP network. You can configure the driver to communicate with up to 63 devices on this network, such as 1756-ENET modules or PLC-5E controllers.

A. Go to RSLinx software.

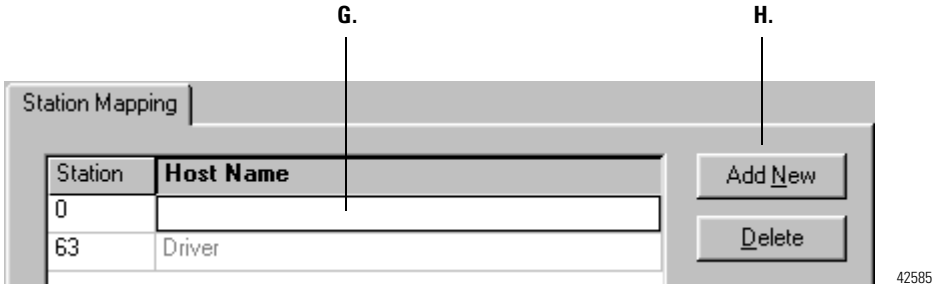
B. From the *Communications* menu, choose *Configure Drivers*.

C. From the *Available Driver Types* list, choose *Ethernet devices*.

D. Choose *Add New*.

E. If you want assign a descriptive name to the driver, change the default name.

F. Choose *OK*.



G. In the *Host Name* column, type the IP address or host name of an EtherNet/IP device with which you want to communicate.

Examples:

- aurora6
- 130.151.136.164

H. Do you want to communicate with another EtherNet/IP device on this network?

If:	Then:
Yes	1. Choose *Add New*. 2. Go to Step G.
No	Go to the next step.

I. Choose *OK*.

J. Choose *Close*.

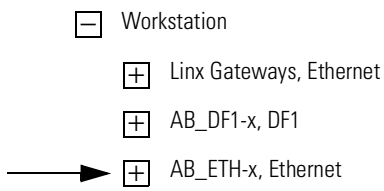
Select a Path

A. Open the RSLogix 5000™ project for the controller.

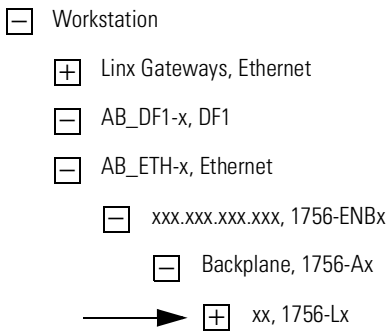
B. From the *Communications* menu, select *Who Active*.

To expand a network one level, do one of the following:

- Double-click the network.
- Select the network and press the → key.
- Click the + sign.



C. Expand the Ethernet driver to the level of the controller.



D. Select the controller and choose a button. You may have to confirm the action.

To:	Choose:
monitor the project in the controller	*Go Online*
transfer a copy of the project from the controller to RSLogix 5000 software	*Upload*
transfer the open project to the controller	*Download*

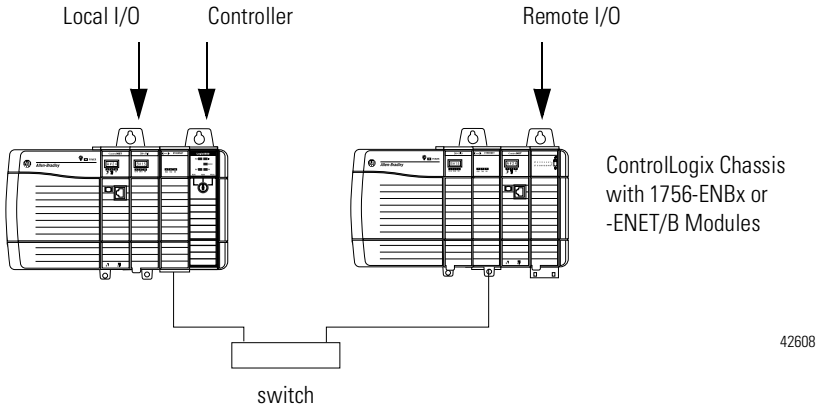
Notes:

Communicate with 1756 I/O over an EtherNet/IP Network

When to Use This Procedure

Use this procedure to monitor and control devices that wired to 1756 I/O modules:

- local modules
- remote modules where 1756-ENBx or 1756-ENET/B modules connect the local and remote chassis over an EtherNet/IP network



Before You Begin

Before you use this procedure, do the following:

1. To communicate with 1756 I/O over an EtherNet/IP network, you must use 1756-ENBx or -ENET/B modules. If you have a 1756-ENET/A module, determine if you can update the module:

For this 1756-ENET/A revision:	Then:
1.18 or later (latch of the RJ--45 connector points to the left)	Update the firmware of module to revision 2.6 or later.
earlier than 1.18 (latch of the RJ--45 connector points to the right)	Contact your Rockwell Automation representative or local distributor.

2. Configure the ENB or ENET modules in the local and remote chassis. Refer to "Configure an EtherNet/IP Module" on page 1-1.

How to Use This Procedure

IMPORTANT If the all the I/O modules are in the same chassis as the controller (no remote I/O), go to Add I/O Modules on page 3-8.

If you have not already done so in a previous procedure, do the following preliminary tasks:

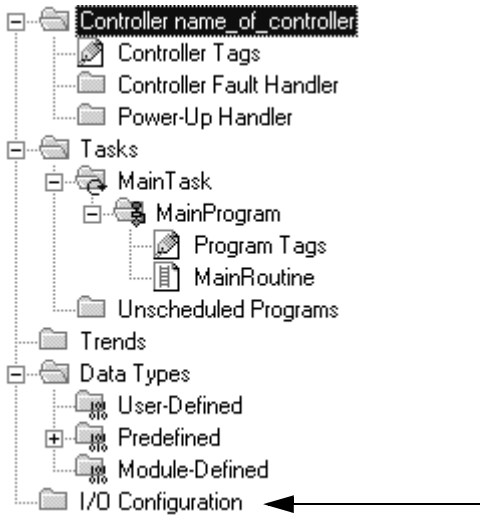
- Add the Local 1756-ENBx or -ENET Module
- Add the Remote 1756-ENBx or -ENET Module

To complete this procedure, do the following tasks:

- Add I/O Modules
- Create Aliases
- Validate Connections

Add the Local 1756-ENBx or -ENET Module

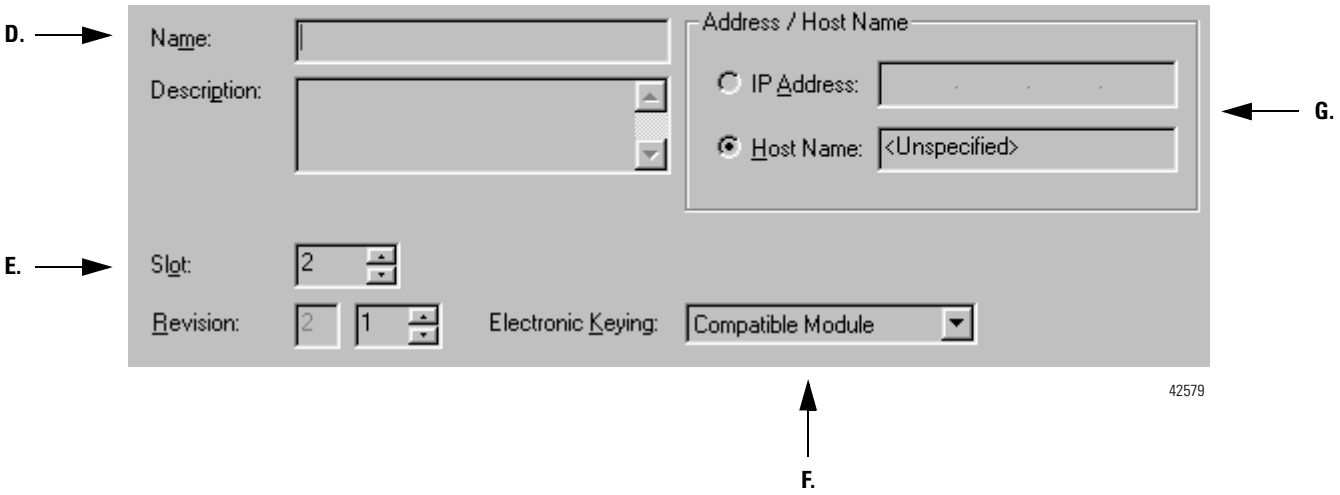
A. Open the RSLogix 5000™ project offline.



B. Is the local ENB or ENET module already in the I/O configuration of the controller?

If:	Then:
yes	Go to Add the Remote 1756-ENBx or -ENET Module
no	Right-click *I/O Configuration* and select *New Module*.

C. Select your type of ENB or ENET module and choose *OK*.



D. Type a name for the module.

E. Type or select the slot number where the module is installed.

F. How closely must any module that is installed in this slot match the information on this tab?

If:	Then select:	Notes:
all information must match: • type • catalog number • vendor • major and minor revision number	*Exact Match*	
all information *except* the minor revision number	*Compatible Module*	If you select *Compatible Module*, you can still replace a 1756-ENET/B module with a 1756-ENBT module. However, you *cannot* replace an ENBT module with an ENET/B module.
no information must match	*Disable Keying*	

G. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	1. Select the *IP Address* button. 2. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

H. Click *Finish*.

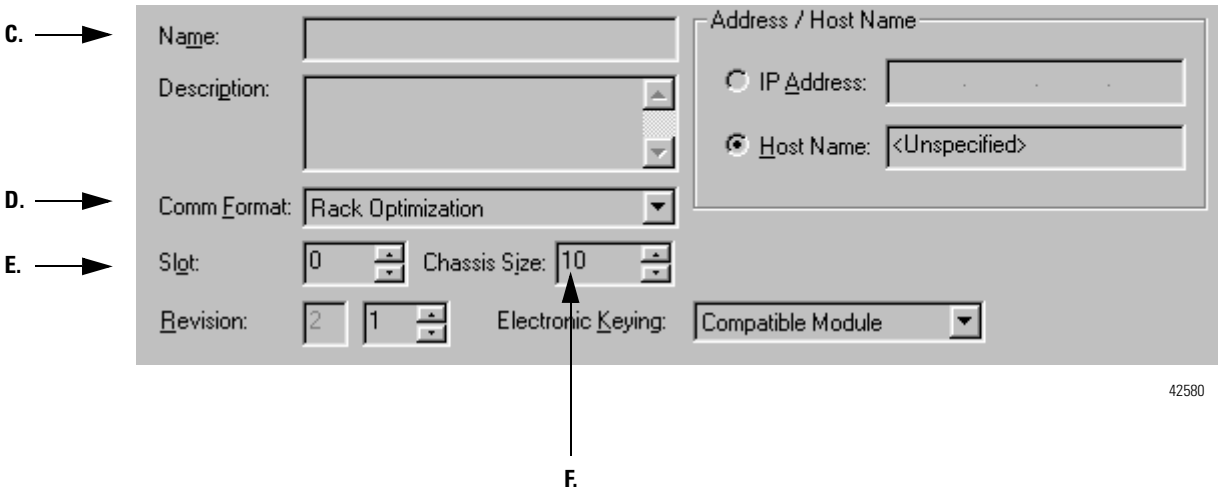
Add the Remote 1756-ENBx or -ENET Module

I/O Configuration

[x] 1756-ENBx local_ENB/ENET ←

A. Right-click *local_ENB/ENET* and select *New Module*.

B. Select your type of ENB or ENET module and choose *OK*.



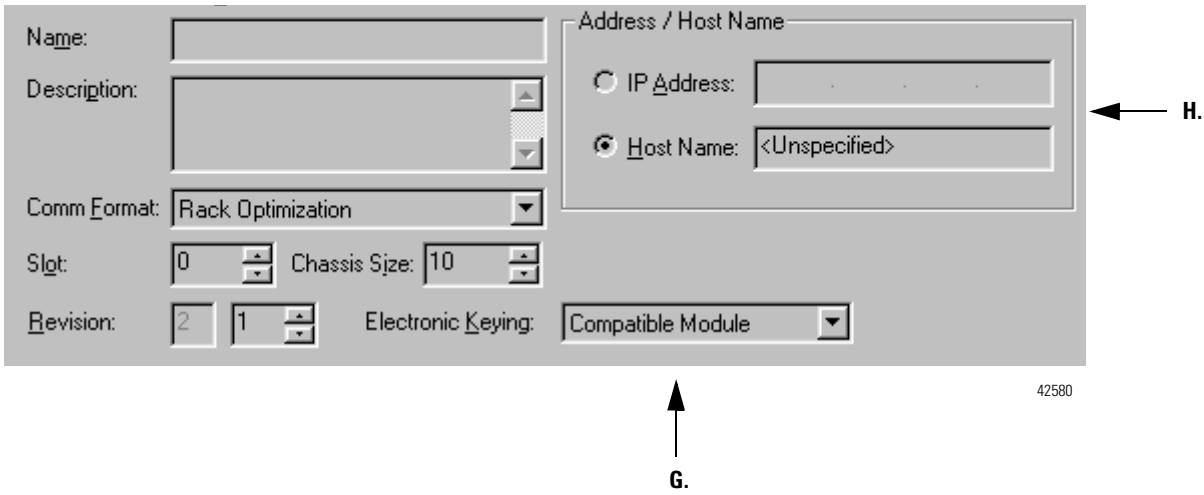
C. Type a name for the module. Use a name that identifies the I/O in the chassis.

D. Are most of the modules in the chassis non-diagnostic, digital I/O modules?

If:	Then select
Yes	*Rack Optimization*
No	*None*

E. Type or select the slot number where the module is installed

F. Type or select the number of slots in the remote chassis.



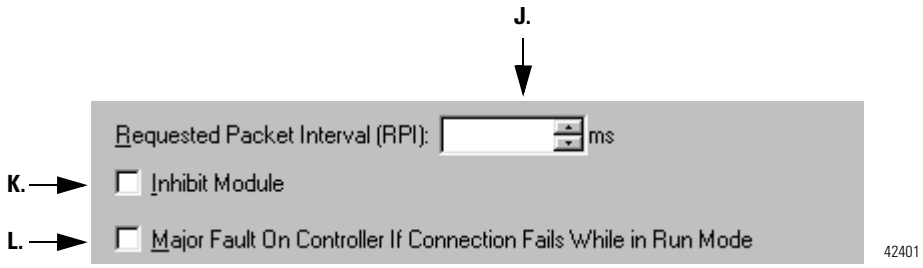
G. How closely must any module in this slot match the information on this tab?

If:	Then select:	Notes:
all information must match: • type • catalog number • vendor • major and minor revision number	*Exact Match*	
all information *except* the minor revision number	*Compatible Module*	If you select *Compatible Module*, you can still replace a 1756-ENET/B module with a 1756-ENBT module. However, you *cannot* replace an ENBT module with an ENET/B module.
no information must match	*Disable Keying*	

H. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	1. Select the *IP Address* button. 2. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

I. Click *Next*.



J. In step D., which Comm Format did you select?

If:	Then:
Rack Optimization	Type the rate at which the fastest device in the chassis must update.
None	No RPI is required. Go to the next step.

K. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

L. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

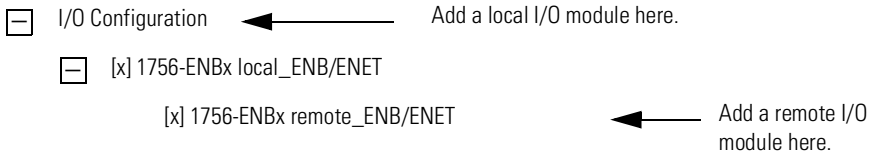
M. Click *Finish*.

Add I/O Modules

In this task, you add I/O modules to the I/O configuration of the controller.

A. Is the module in the I/O configuration of another controller?

If:	And it is an:	And you want to:	Then:
no	→	→	Go to the next step.
yes	output module	→	Go to the next step.
	input module	maintain communication with the module if it loses communication with the other controller	1. Copy the module from the I/O configuration of the other controller. 2. Paste the module into the I/O configuration of this controller. 3. Go to Create Aliases
		stop communication with the module if it loses communication with the other controller	Go to the next step.


I/O Configuration
Add a local I/O module here.
[x] 1756-ENBx local_ENB/ENET
[x] 1756-ENBx remote_ENB/ENET
Add a remote I/O module here.

B. Where is the module located?

If it is in:	Then:
same chassis as controller	right-click *I/O Configuration* and select *New Module*.
remote chassis	right-click the remote ENB or ENET module and select *New Module*.

C. Select the type of module and click *OK*.

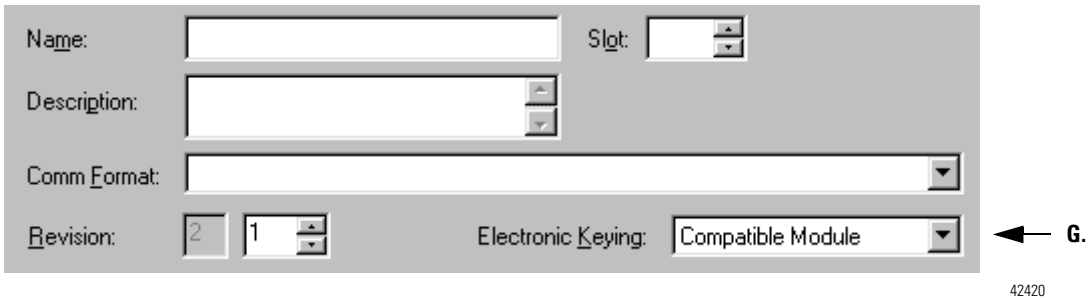
D. Type a name for the module.

E. Type or select the slot number where the module is installed.

F. Select a *Comm Format*:

IMPORTANT If the module is also in the I/O configuration of another controller, then select the *Listen Only* version of the Comm Format (e.g., *Listen Only - Input Data*).

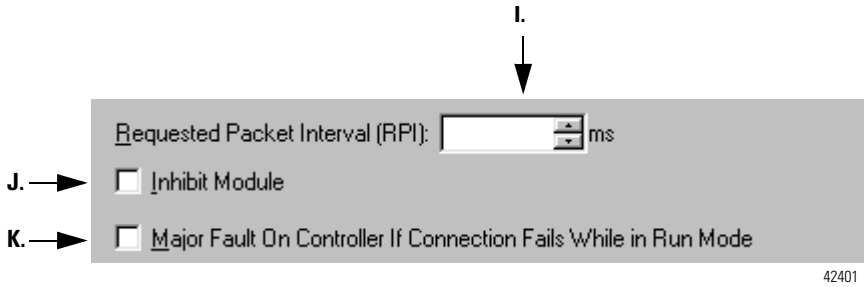
If this module is a:	And:	And you want to:	Then select:
diagnostic digital input	→	→	*Full Diagnostics - Input Data*
non-diagnostic digital input	local chassis	time stamp a change in data	*CST Timestamped Input Data*
		omit time stamps	*Input Data*
	remote chassis	→	*Rack Optimization*
diagnostic digital output	→	schedule when to apply outputs	*Full Diagnostics - Scheduled Output Data*
	→	not schedule when to apply outputs	*Full Diagnostics - Output Data*
fused digital output	→	schedule when to apply outputs	*CST Timestamped Fuse Data - Scheduled Output Data*
	→	not schedule when to apply outputs	*CST Timestamped Fuse Data - Output Data*
non-diagnostic and non-fused digital output	local chassis	schedule when to apply outputs	*Scheduled Output Data*
		not schedule when to apply outputs	*Output Data*
	remote chassis	→	*Rack Optimization*
non-isolated analog input	floating point mode provides sufficient sample time	time stamp when the data is sampled	*CST Timestamped Float Data -* `wiring_mode`
		omit the time stamp	*Float Data -* `wiring_mode`
	floating point mode *does not* provide sufficient sample time	time stamp when the data is sampled	*CST Timestamped Integer Data -* `wiring_mode`
		omit the time stamp	*Integer Data -* `wiring_mode`
isolated or temperature measuring analog input	25 ms sample time or greater is sufficient	time stamp when the data is sampled	*CST Timestamped Float Data*
		omit the time stamp	*Float Data*
	sample time must be less than 25 ms	time stamp when the data is sampled	*CST Timestamped Integer Data*
		omit the time stamp	*Integer Data*
analog output	associated inputs are REALs	time stamp the data echo	*CST Timestamped Float Data*
		omit the time stamp	*Float Data*
	associated inputs are INTs	time stamp the data echo	*CST Timestamped Integer Data*
		omit the time stamp	*Integer Data*



G. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

H. Click *Next*.



I. In step F., did you select *Rack Optimization* as the Comm Format?

If:	Then:
No	Type the rate at which the fastest device that is wired to the module must update.
Yes	No RPI is required. Go to the next step.

J. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

K. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

L. Click *Finish*.

Create Aliases

In this task, you convert tags in your programs to aliases for I/O points or channels (devices). As an alias for an I/O point or channel, each tag:

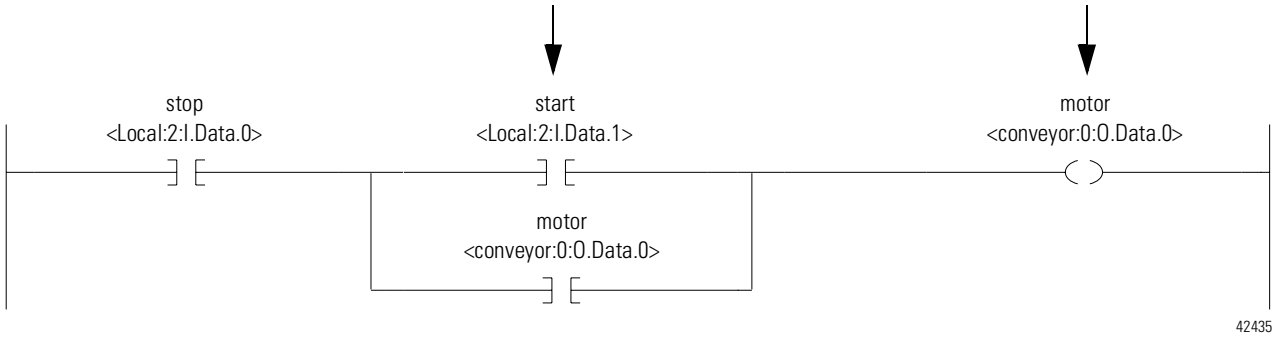
- provides a descriptive name for the device that is wired to the point or channel
- represents the value of the point or channel. When one changes, the other reflects the change.

EXAMPLE Create aliases

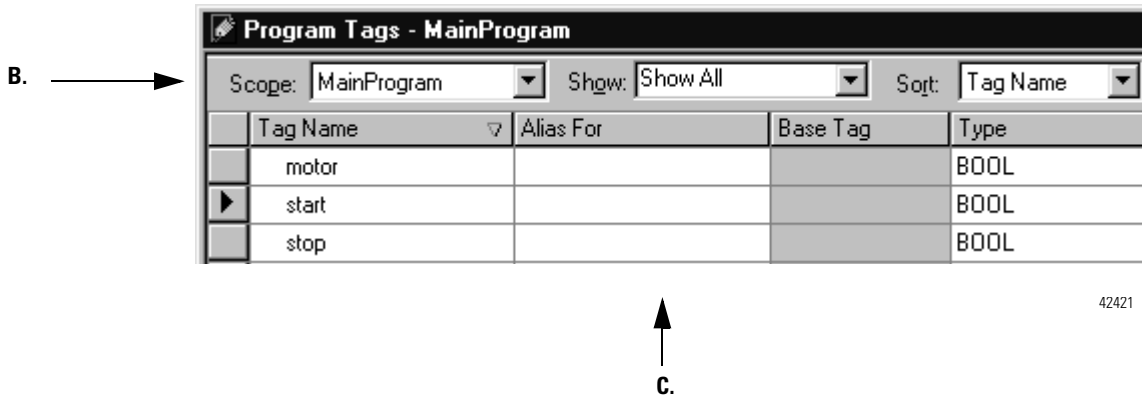
The following logic was initially programmed using descriptive tag names, such as *start* and *motor*. Later, the tags were converted to aliases for the corresponding I/O devices.

start is an alias for the push button that is wired to point 1 of the module that is in slot 2 of the local chassis. When the push button is on, *start* is on.

motor is an alias for the starter contactor that is wired to point 0 of the module that is in slot 0 of a remote chassis (named conveyor). When *motor* turns on, the starter contactor turns on.



A. From the *Logic* menu, select *Edit Tags*.



B. Select the scope of the descriptive tag.

C. To the right of the tag name, click the *Alias For* cell.

The cell displays a ▼

D. Click the ▼

E. Click the *Controller Scoped Tags* button, if it is available. (All the data for I/O modules is at the controller scope.)

F. Select the I/O device that the tag represents:

If the device is:	Then:
digital	1. Next to *name:slot:X,* click the + sign. 2. Click the *Data* member. 3. To the right of the *Data* member, click ▼ 4. Click the point number of the device.
analog	1. Next to *name:slot:X,* click the + sign. 2. Scroll down and double-click *ChzData*.

Where:	Is:	
name	name of the chassis:	
	If:	Then the name is:
	local	Local
	remote	name of the communication module in the chassis, such as a 1756-ENBx or 1756-CNB module.
slot	slot number of the module	
X	type of device:	
	If:	Then:
	input	*I*
	output	*O*
Chz	channel that the device is wired to	

G. Press the *Enter* key or click another cell.

When you finish, the Tags window should look similar to the following:

Tag Name	Alias For	Base Tag
start	conveyor:1:I.Data.1(C)	conveyor:1:I.Data.1(C)

start is an alias for point 1 of the input module that is in slot 1 of a remote chassis (named conveyor).

TIP

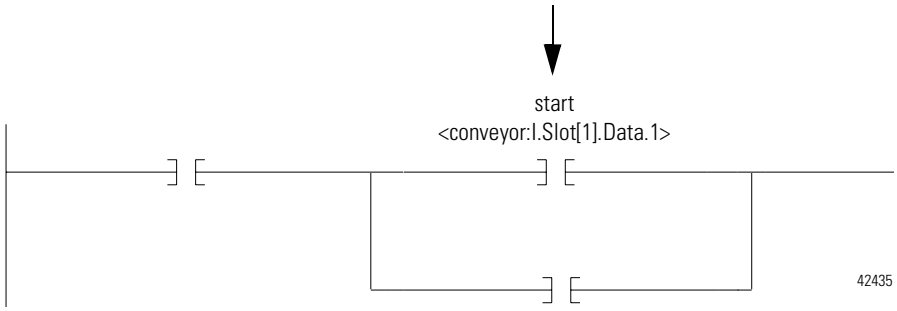
Even if the I/O module uses the Rack Optimization Comm Format, address the required point as described in step F.

Tag Name	Alias For	Base Tag
start	conveyor:1:I.Data.1(C)	conveyor:I.Slot[1].Data.1(C)

start is an alias for point 1 of the input module that is in slot 1 of a remote chassis (named conveyor).

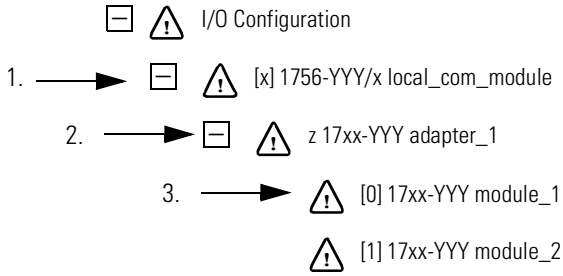
Because the module uses the Rack Optimization format, a structure associated with the communication module in the remote chassis actually transfers the data.

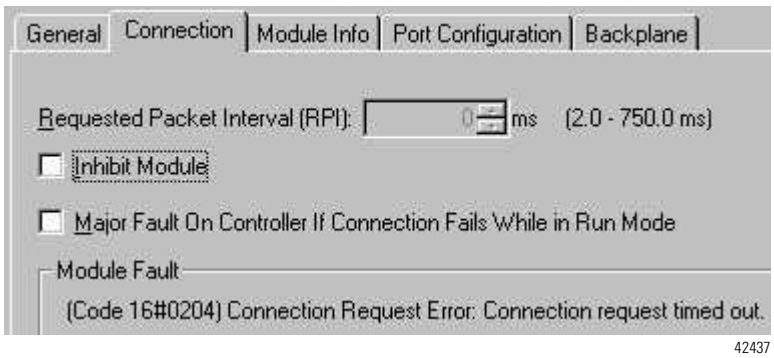
However, the ladder logic displays the address of the data within the structure for the communication module (e.g., ENB, CNB):



Validate Connections

Is this task, you verify that the controller can communicate with the devices that you have just configured.

Step:	Detailed actions:	
A. Determine if communications are established.	Is a ⚠ over the I/O Configuration folder?	
	If:	**Then:**
	No	The controller can communicate with the module.
	Yes	Communications are not established. Go to the next step.
B. Identify a fault. Start at the local communication module and work down through the tree.		
C. Identify the fault code.	1. Right-click the module and select *Properties*. 2. Click the *Connection* tab. 3. Identify the code for the fault.	



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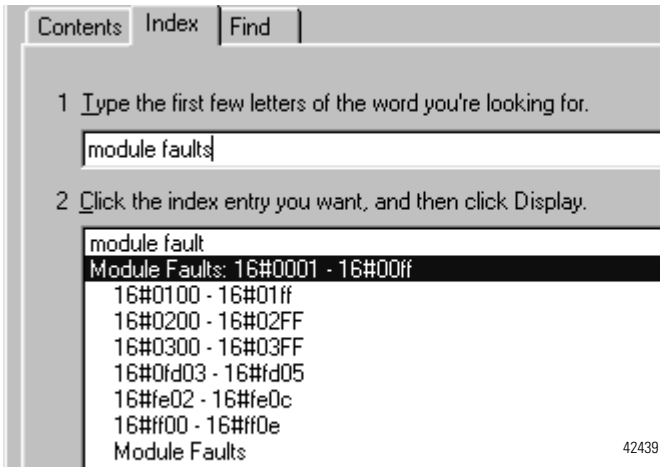
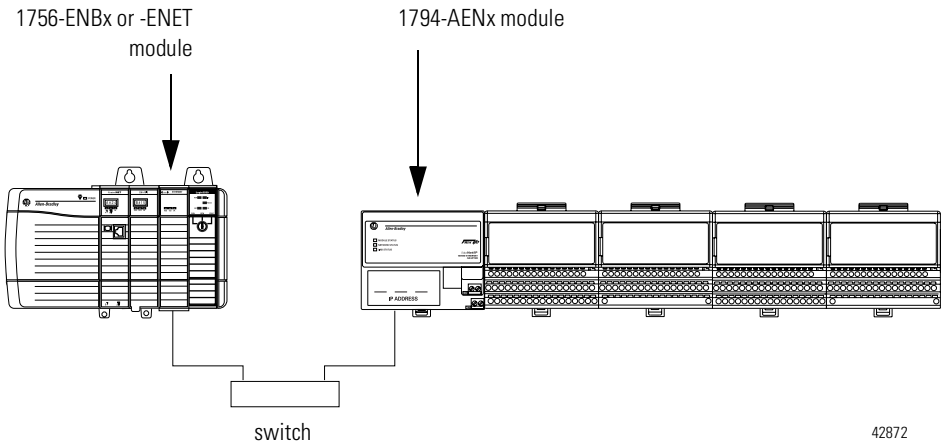
Step:	Detailed actions:
D. Clear the fault.	1. From the *Help* menu, select *Contents*. 2. Click the *Index* tab. 3. Type *module faults*. **4.** →  4. Select the range for the code and click *Display*. 5. Scroll down to your fault code and follow the recommendations.
E. Go to step A.	

Communicate with 1794 I/O Over an EtherNet/IP Network

When to Use This Procedure

Use this procedure to monitor and control I/O devices that are wired to 1794 I/O modules when a:

- 1756-ENBx or a 1756-ENET/B module connects the local chassis to a EtherNet/IP network.
- 1794-AENx module connects the 1794 I/O modules to the same EtherNet/IP network.



Before You Use This Procedure

Before you use this procedure, do the following:

1. To communicate with I/O modules over an EtherNet/IP network, you must use a 1756-ENBx or -ENET/B module in the local chassis. If you have a 1756-ENET/A module, determine if you can update the module:

For this 1756-ENET/A revision:	Then:
1.18 or later (latch of the RJ--45 connector points to the left)	Update the firmware of module to revision 2.6 or later.
earlier than 1.18 (latch of the RJ--45 connector points to the right)	Contact your Rockwell Automation representative or local distributor.

2. Configure the following modules:
   - ENB or ENET module in the local chassis
   - AEN module

   Refer to "Configure an EtherNet/IP Module" on page 1-1.

How to Use This Procedure

If you have not already done so in a previous procedure, do the following preliminary step:

- Add the local 1756-ENBx or -ENET module

To complete this procedure, do the following steps:

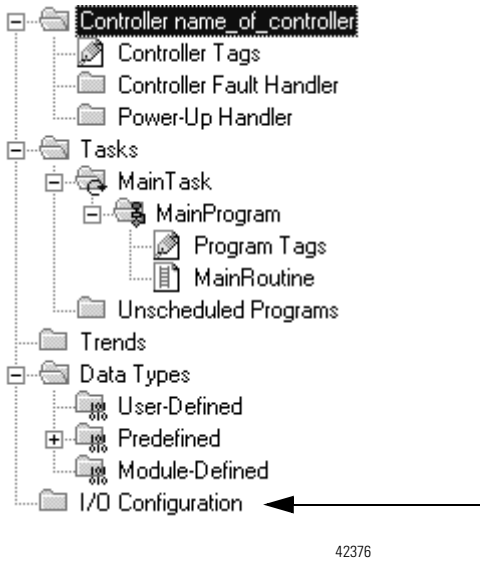
- Add the Remote 1794-AENx Module
- Add I/O Modules
- Address I/O

To check your work, do the following step:

- Validate Connections

Add the local 1756-ENBx or -ENET module

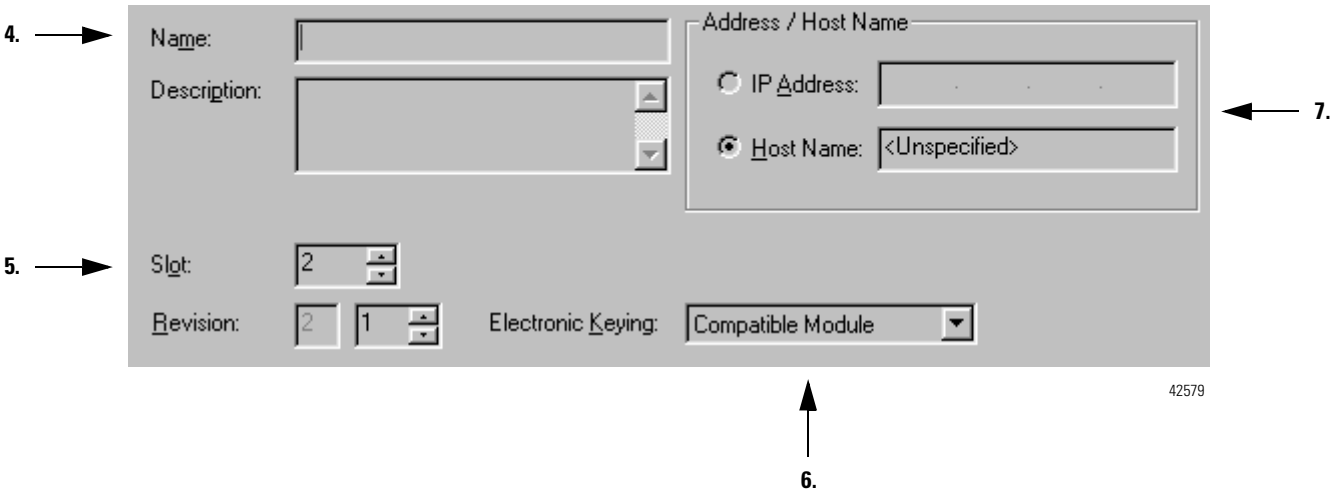
1. Open the RSLogix 5000™ project offline.



2. Is the local ENB or ENET module already in the I/O configuration of the controller?

If:	Then:
Yes	Go to Add the Remote 1794-AENx Module.
No	Right-click *I/O Configuration* and select *New Module*.

3. Select your type of ENB or ENET module and choose *OK*.



4. Type a name for the module.

5. Type or select the slot number where the module is installed.

6. How closely must any module that is installed in this slot match the information on this tab?

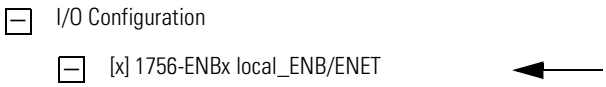
If:	Then select:	Notes:
all information must match: • type • catalog number • vendor • major and minor revision number	*Exact Match*	
all information *except* the minor revision number	*Compatible Module*	If you select *Compatible Module*, you can still replace a 1756-ENET/B module with a 1756-ENBT module. However, you *cannot* replace an ENBT module with an ENET/B module.
no information must match	*Disable Keying*	

7. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	A. Select the *IP Address* button. B. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

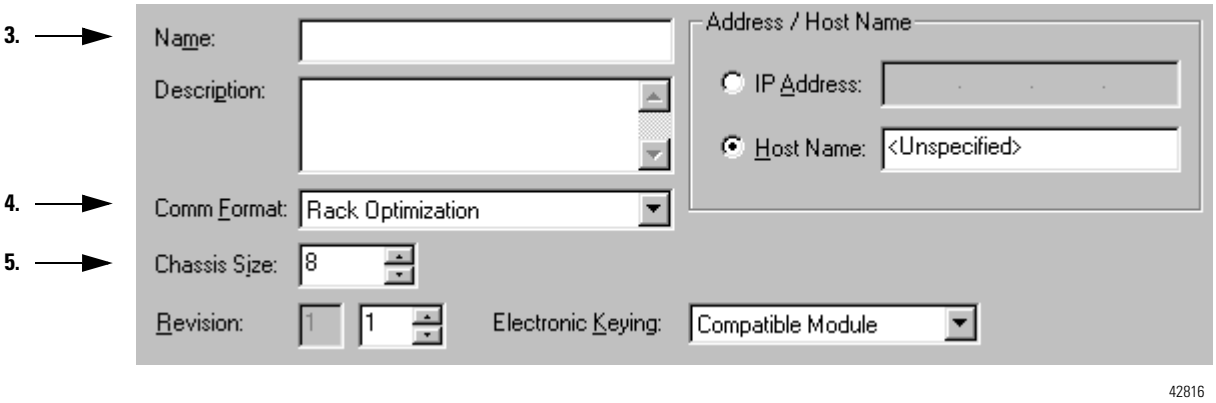
8. Click *Finish*.

Add the Remote 1794-AENx Module



1. Right-click *local_ENB/ENET* and select *New Module*.

2. Select the type of AEN module that you are using and click *OK*.

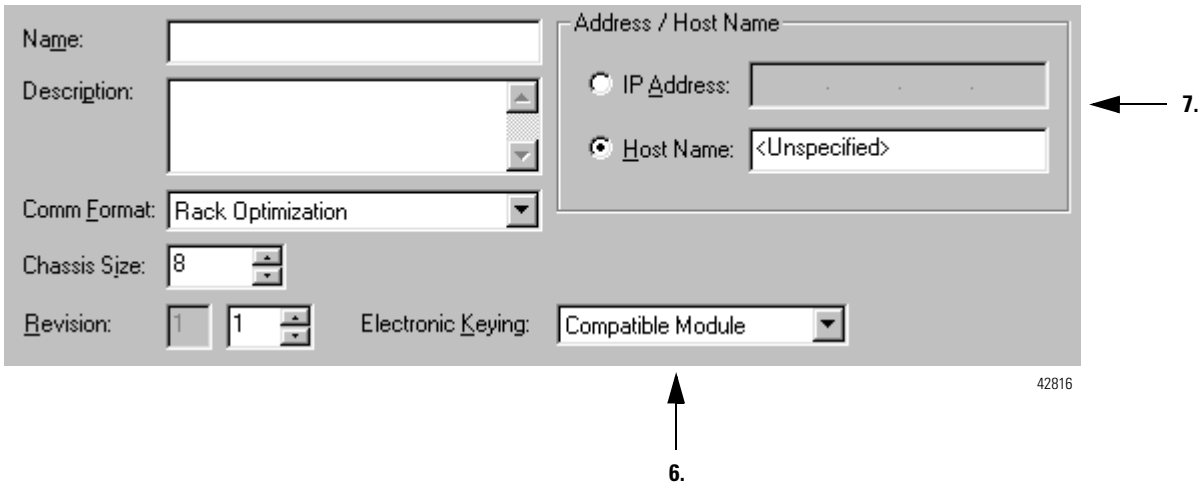


3. Type a name for the module. Use a name that identifies the I/O on this rail.

4. Are most of the modules on this rail digital I/O modules?

If:	Then select
Yes	*Rack Optimization*
No	*None*

5. Type or select the number of I/O modules on this rail.



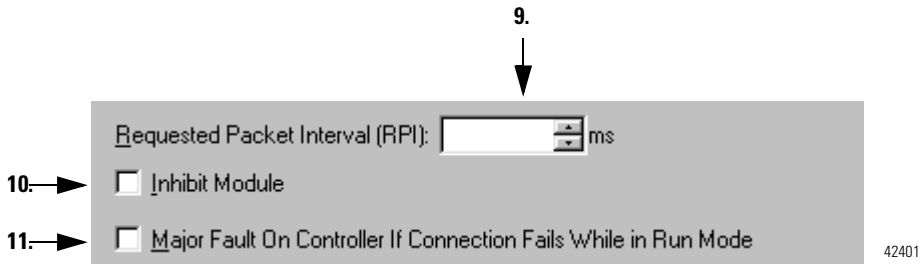
6. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

7. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	A. Select the *IP Address* button. B. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

8. Click *Next*.



9. In step 4., which Comm Format did you select?

If:	Then:
Rack Optimization	Type the rate at which the fastest device on the rail must update.
None	No RPI is required. Go to the next step.

10. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

11. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

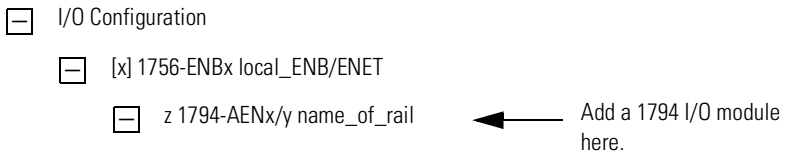
12. Click *Finish*.

Add I/O Modules

In this task, you add I/O modules to the I/O configuration of the controller.

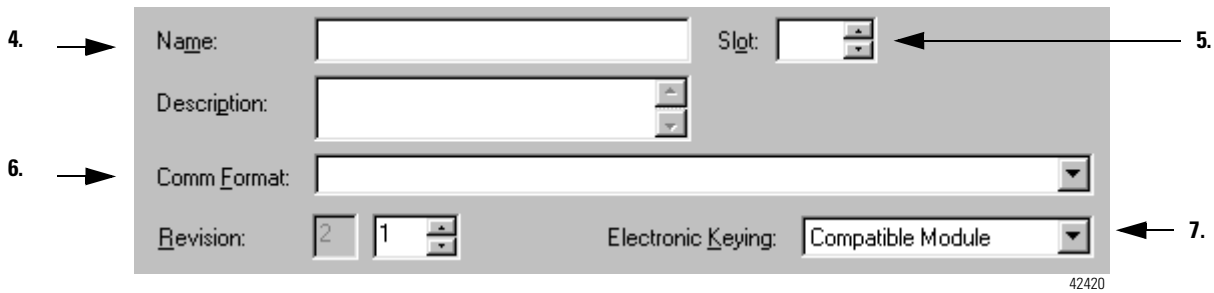
1. Is the module in the I/O configuration of another controller?

If:	And it is an:	And you want to:	Then:
no	→	→	Go to the next step.
yes	output module	→	Go to the next step.
	input module	maintain communication with the module if it loses communication with the other controller	A. Copy the module from the I/O configuration of the other controller. B. Paste the module into the I/O configuration of this controller. C. Go to the next task.
		stop communication with the module if it loses communication with the other controller	Go to the next step.



2. Right-click the AEN module and select *New Module*.

3. Select the type of module and click *OK*.



4. Type a name for the module.

5. Type or select the slot number where the module is installed.

6. Select a *Comm Format*:

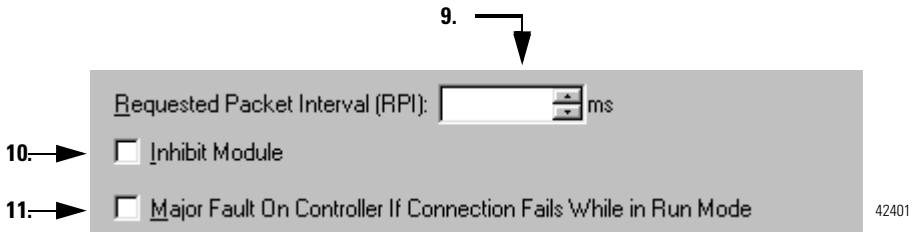
IMPORTANT If the module is also in the I/O configuration of another controller, then select the *Listen Only* version of the Comm Format (e.g., *Listen Only - Input Data*).

If this module is a:	And the:	And the module must:	Then select:
digital input	Comm Format of the AEN is *Rack Optimization*	update at the RPI of the AEN	*Rack Optimization*
		update faster than the RPI of the AEN	*Input Data*
	Comm Format of the AEN is *None*	→	*Input Data*
digital input/output	Comm Format of the AEN is *Rack Optimization*	update at the RPI of the AEN	*Rack Optimization*
		update faster than the RPI of the AEN	*Data*
	Comm Format of the AEN is *None*	→	*Data*
digital output	Comm Format of the AEN is *Rack Optimization*	update at the RPI of the AEN	*Rack Optimization*
		update faster than the RPI of the AEN	*Output Data*
	Comm Format of the AEN is *None*	→	*Output Data*
analog	→	→	*Data*

7. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

8. Click *Next*.



9. In step 6., did you select *Rack Optimization* as the Comm Format?

If:	Then:
No	Type the rate at which the fastest device that is wired to the module must update.
Yes	No RPI is required. Go to the next step.

10. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

11. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

12. Click *Finish*.

Address I/O

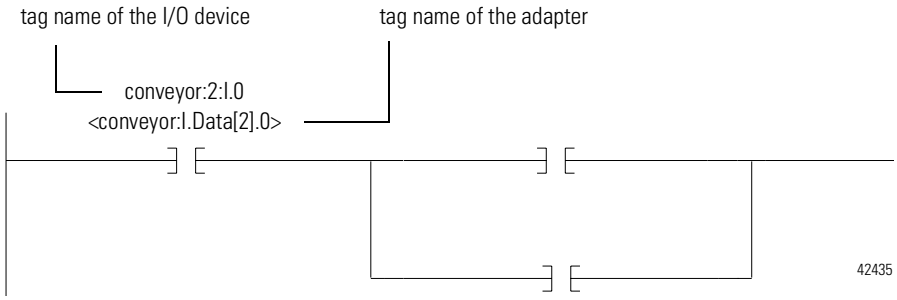
To monitor or control an I/O device, assign the tag name of the device to an instruction in your logic:

- For step-by-step instructions on how to enter logic and tag names, see the *Logix5000 Controllers Common Procedures*, publication 1756-PM001.
- All the data for I/O modules is at the controller scope. As you assign addresses, click the *Controller Scoped Tags* button to see the I/O tags.
- Use the following table to select the address of an I/O device:

If the device is:	And it Comm Format is:	Then use this address:
digital	Data (e.g., Input Data, Output Data)	*name*:*slot*:*type*.Data.*bit*
	Rack Optimization	*name*:*slot*:*type*.*bit*
analog input	→	*name*:*slot*:*type*.*Ch#* InputData
analog output	→	*name*:*slot*:*type*.*Ch#* OutputData

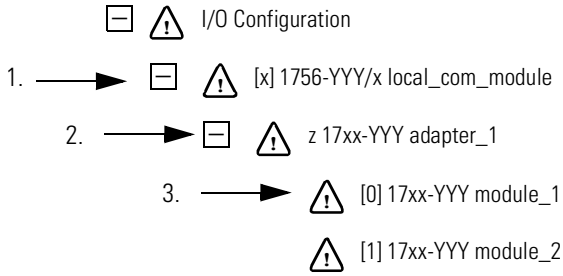
Where:	Is:	
name	name of the adapter module on the rail, such as an AEN or ACN module	
slot	slot number of the I/O module	
type	type of device:	
	If:	**Then:**
	input	I
	output	O
bit	point (bit) number of the device	
Ch#	channel that the device is wired to	

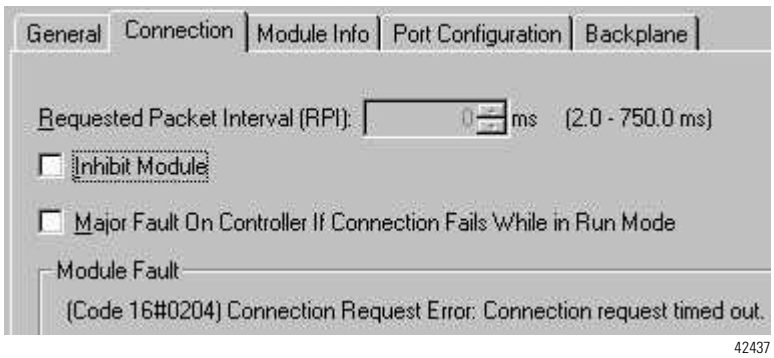
- When you choose rack optimization for an I/O module, its tags are created as aliases for the tags of the adapter module. In your logic, you see the tag of the device as aliases for a tag of the adapter module. (The tag name of the adapter is in angle brackets.)



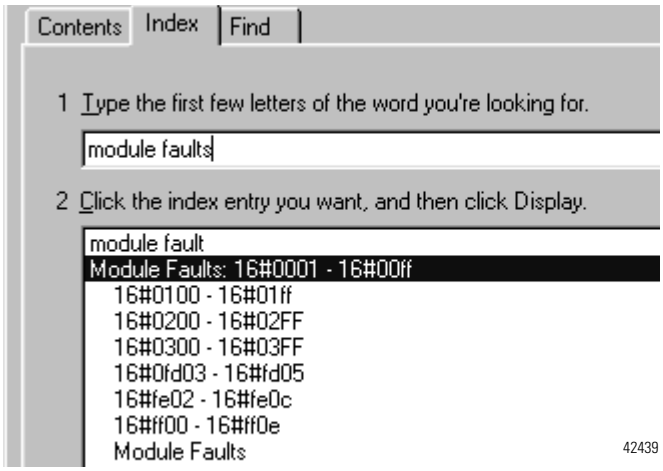
Validate Connections

Is this task, you verify that the controller can communicate with the devices that you have just configured.

Step:	Detailed actions:	
A. Determine if communications are established.	Is a ⚠ over the I/O Configuration folder?	
	If:	**Then:**
	No	The controller can communicate with the module.
	Yes	Communications are not established. Go to the next step.
B. Identify a fault. Start at the local communication module and work down through the tree.		
C. Identify the fault code.	1. Right-click the module and select *Properties*. 2. Click the *Connection* tab. 3. Identify the code for the fault.	



42437

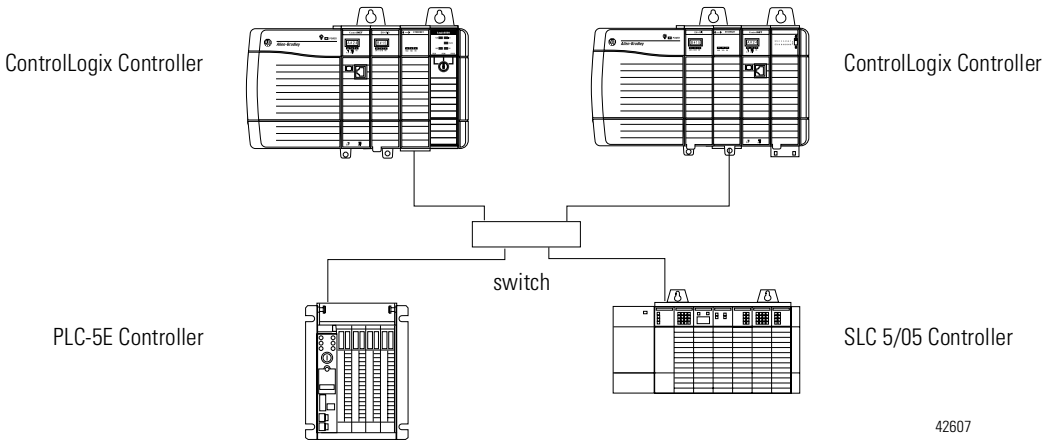
Step:	Detailed actions:
D. Clear the fault.	1. From the *Help* menu, select *Contents*. 2. Click the *Index* tab. 3. Type *module faults*. **4.**  4. Select the range for the code and click *Display*. 5. Scroll down to your fault code and follow the recommendations.
E. Go to step A.	

Communicate with Another Controller over an EtherNet/IP Network

When to Use This Procedure

Use this procedure to transfer data from one controller to another controller over an EtherNet/IP network:

- ControlLogix controller to another ControlLogix controller
- ControlLogix controller to a PLC-5E® or SLC 5/05™ controller
- PLC-5E or SLC 5/05 controller to a ControlLogix controller



Before You Begin

Before you use this procedure, do the following:

1. To produce and consume tags over an EtherNet/IP network, you must use 1756-ENBx or -ENET/B modules. If you have a 1756-ENET/A module, determine if you can update the module:

For this 1756-ENET/A revision:	Then:
1.18 or later (latch of the RJ--45 connector points to the left)	Update the firmware of module to revision 2.6 or later.
earlier than 1.18 (latch of the RJ--45 connector points to the right)	Contact your Rockwell Automation representative or local distributor.

2. Configure the ENB or ENET modules. Refer to "Configure an EtherNet/IP Module" on page 1-1.

Select a Communication Method

To communicate with another controller, you have the following options:

If the other controller is:	And:	Then:
ControlLogix	The data needs delivery at a specific rate.	Produce and consume a tag. Go to Produce a Tag on page 5-3.
	The data is sent when a specific condition in your application occurs.	Send a message. Go to Add the Local 1756-ENBx or -ENET Module on page 5-14.
PLC-5 SLC 5/05	The ControlLogix controller sends the message.	Send a message. Go to Add the Local 1756-ENBx or -ENET Module on page 5-14.
	The PLC-5 or SLC 5/05 sends the message.	Send a message. Go to Access ControlLogix Data on page 5-23.

Produce a Tag

A. Open the RSLogix 5000™ project for the controller that produces (sends) the data.

B. From the *Logic* menu, select *Edit Tags*.

IMPORTANT

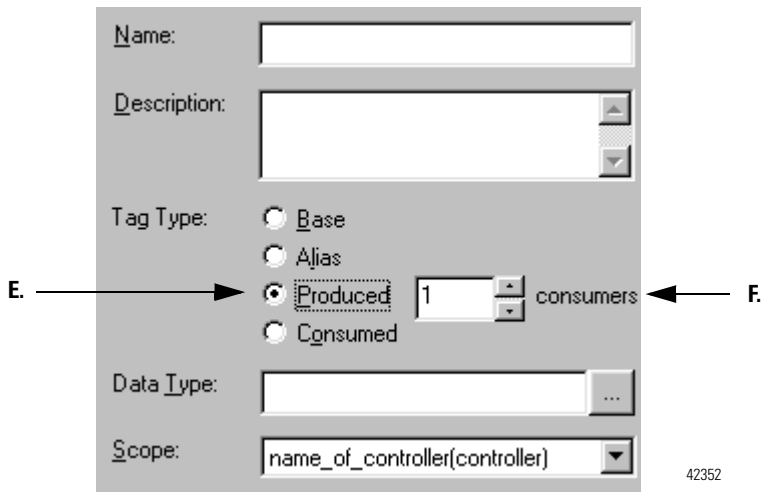
To produce a tag, the tag must meet be:

- controller scope
- one of these data types:
  - DINT
  - REAL
  - array of DINTs or REALs
  - user-defined
- less than or equal to 500 bytes

If the tag does not meet these requirements, reorganize the tag.

C. From *Scope*, select *`name_of_controller`(controller)*. (Only tags that are controller scope can produce data.)

D. Select the tag that will produce the data and press the *ALT* + *Enter* keys.



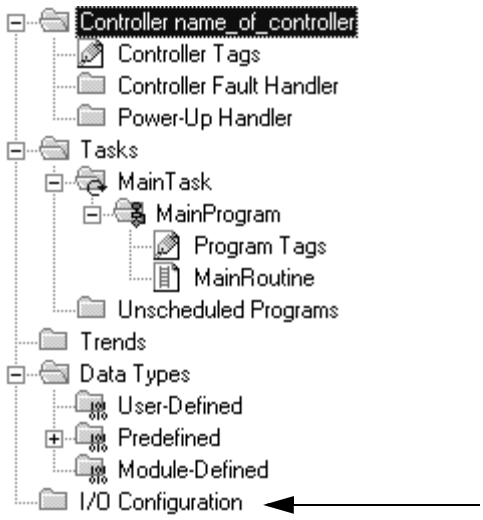
E. Select the *Produced* option button.

F. Type or select the number of controllers that will consume (receive) the tag.

G. Choose *OK*.

Add the Local 1756-ENBx or -ENET Module

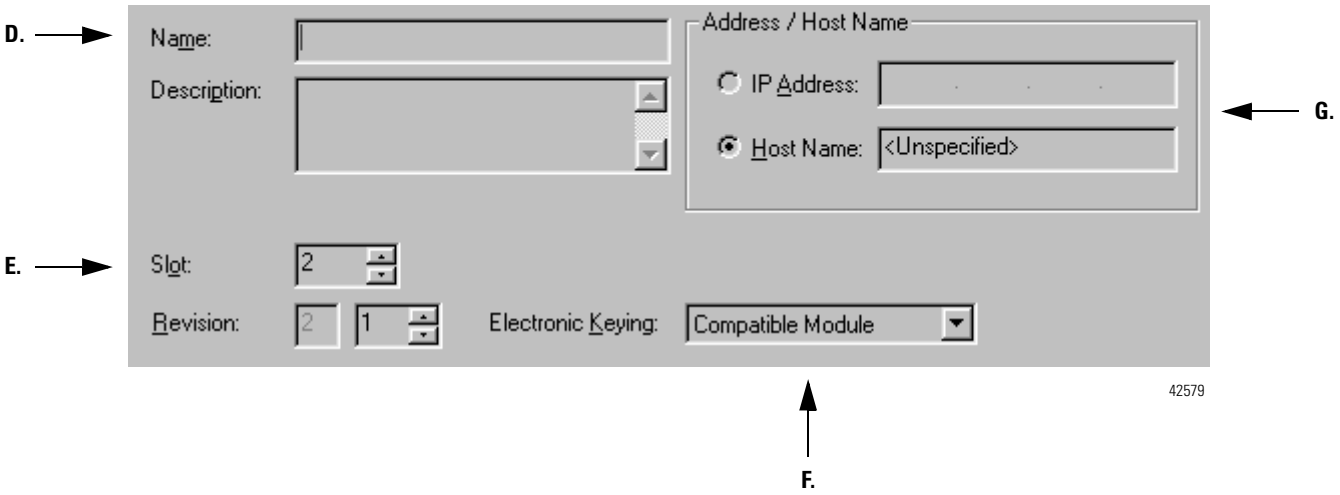
A. Open the RSLogix 5000™ project for the controller that consumes (receives) the data.



B. Is the local ENB or ENET module already in the I/O configuration of the controller?

If:	Then:
yes	Go to the next step.
no	Right-click *I/O Configuration* and select *New Module*.

C. Select your type of ENB or ENET module and choose *OK*.



D. Type a name for the module.

E. Type or select the slot number where the module is installed.

F. How closely must any module that is installed in this slot match the information on this tab?

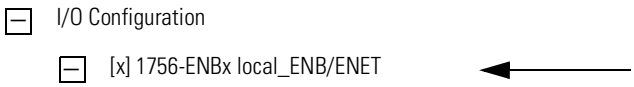
If:	Then select:	Notes:
all information must match: • type • catalog number • vendor • major and minor revision number	*Exact Match*	
all information *except* the minor revision number	*Compatible Module*	If you select *Compatible Module*, you can still replace a 1756-ENET/B module with a 1756-ENBT module. However, you *cannot* replace an ENBT module with an ENET/B module.
no information must match	*Disable Keying*	

G. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	1. Select the *IP Address* button. 2. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

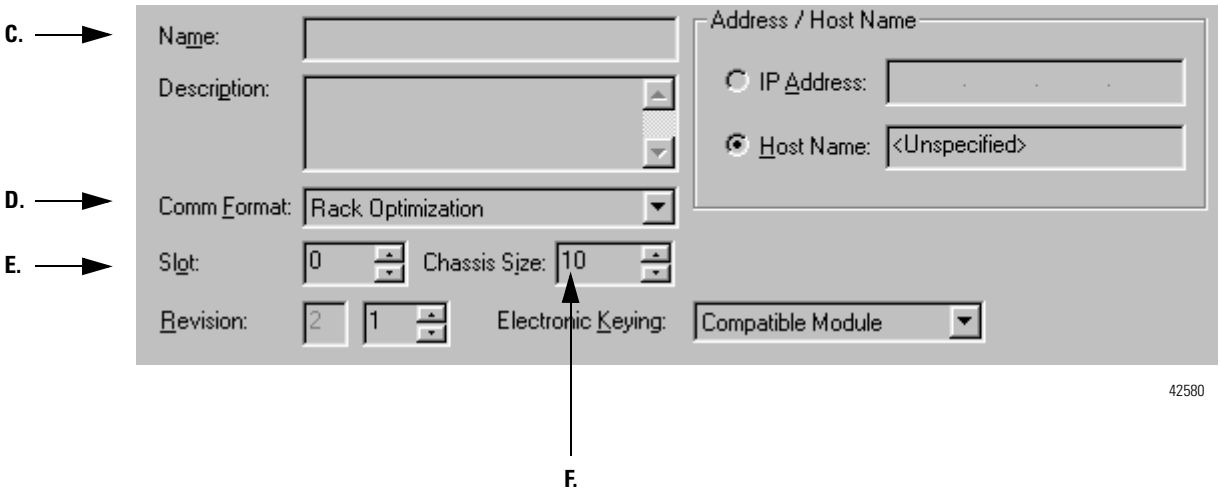
H. Click *Finish*.

Add the Remote 1756-ENBx or -ENET Module



A. Right-click `local_ENB/ENET` and select *New Module*.

B. Select your type of ENB or ENET module and choose *OK*.



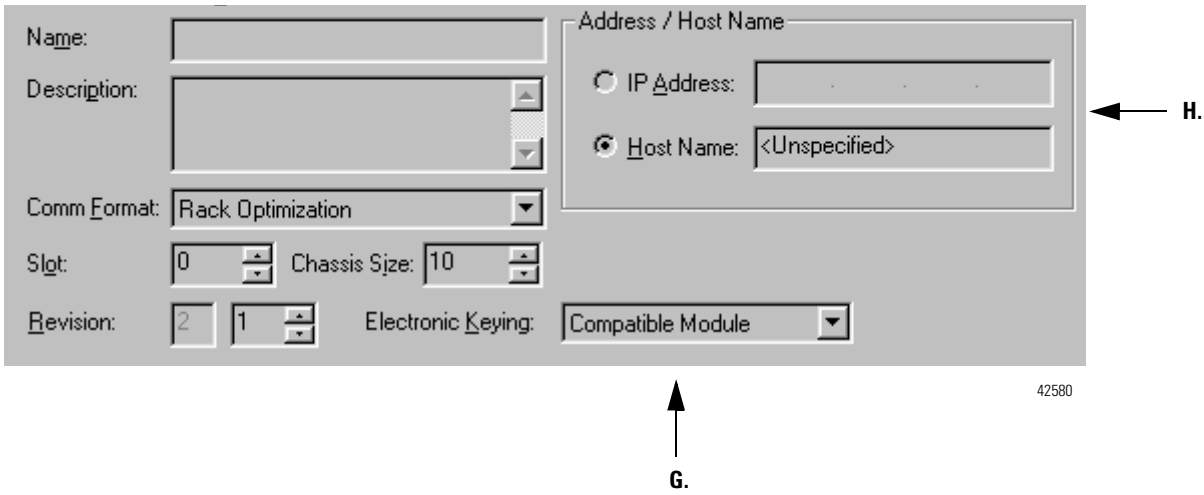
C. Type a name for the module. Use a name that identifies the I/O in the chassis.

D. Are most of the modules in the chassis non-diagnostic, digital I/O modules?

If:	Then select
Yes	*Rack Optimization*
No	*None*

E. Type or select the slot number where the module is installed

F. Type or select the number of slots in the remote chassis.



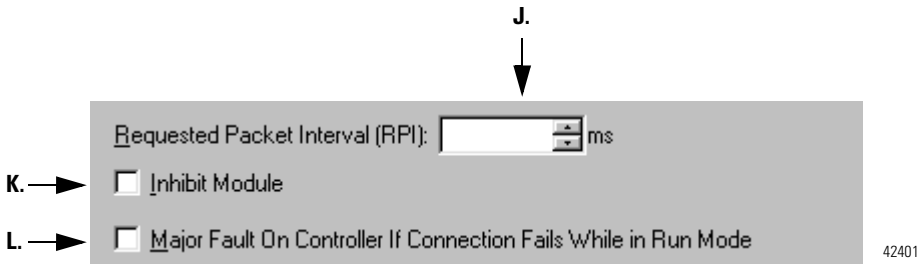
G. How closely must any module in this slot match the information on this tab?

If:	Then select:	Notes:
all information must match: • type • catalog number • vendor • major and minor revision number	*Exact Match*	
all information *except* the minor revision number	*Compatible Module*	If you select *Compatible Module*, you can still replace a 1756-ENET/B module with a 1756-ENBT module. However, you *cannot* replace an ENBT module with an ENET/B module.
no information must match	*Disable Keying*	

H. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	1. Select the *IP Address* button. 2. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

I. Click *Next*.



J. In step D., which Comm Format did you select?

If:	Then:
Rack Optimization	Type the rate at which the fastest device in the chassis must update.
None	No RPI is required. Go to the next step.

K. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

L. If communication with the module fails, how do you want the controller to respond?

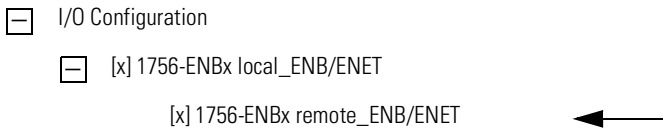
ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

M. Click *Finish*.

Add the Other Controller



A. Right-click *remote_ENB/ENET* and select *New Module*.

B. Select the type of controller and choose *OK*.

C. Type the name of the controller.

D. Type or select the slot number of the controller:

E. Click *Next*.

F. Initially, do you want the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE

Inhibit a module

To make it easier to test a system one module or section at a time:

1. Initially, inhibit all the modules.
2. To test a section of the system, clear the check boxes for the modules of that section (i.e., uninhibit the modules).

G. If communication fails, how do you want the controller to respond?

ATTENTION

If communication with a modules fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

H. Click *Finish*.

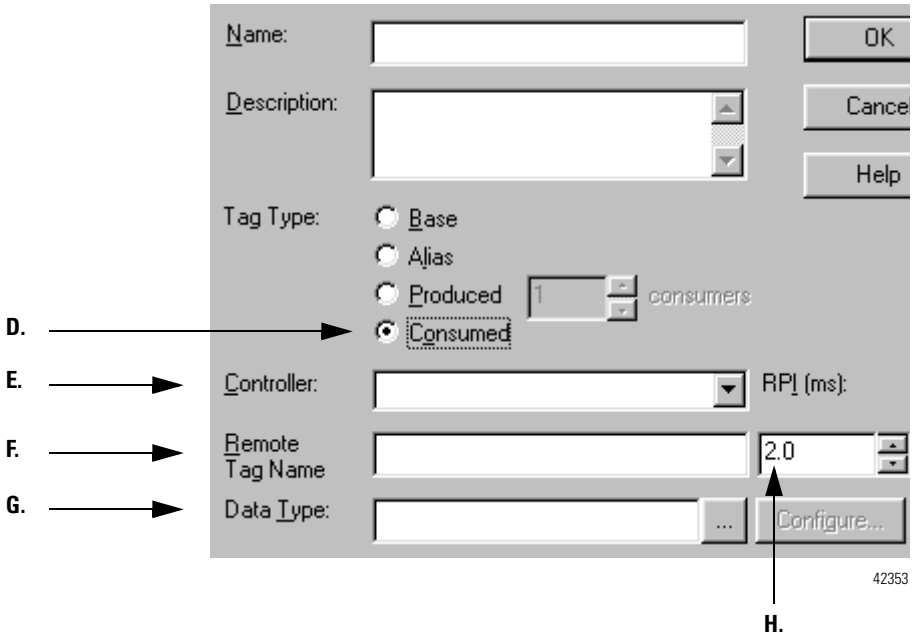
Consume a Tag

In RSLogix 5000 software:

A. From the *Logic* menu, select *Edit Tags*.

B. From *Scope*, select *name_of_controller(controller)*. (Only tags that are controller scope can consume other tags.)

C. Select the tag in this controller that will consume the produced tag and press the *ALT* + *Enter* keys.



D. Select the *Consumed* option button.

E. Select the controller that contains the produced tag.

F. Type the name of the produced tag.

G. Select the same data type as the produced tag.

H. Type or select the time between updates of the tag. Use the highest value permissible for your application.

I. Choose *OK*.

Validate Connections

Is this task, you verify that the controller can communicate with the devices that you have just configured.

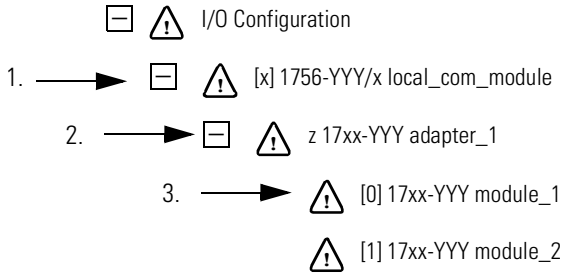
Step: **Detailed actions:**

A. Determine if communications are established.

Is a ⚠ over the I/O Configuration folder?

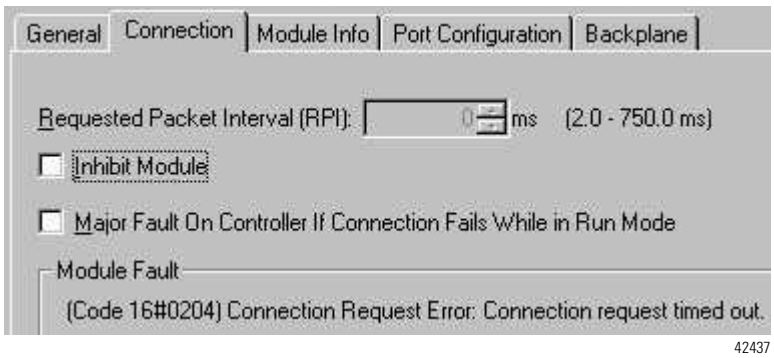
If:	Then:
No	The controller can communicate with the module.
Yes	Communications are not established. Go to the next step.

B. Identify a fault. Start at the local communication module and work down through the tree.

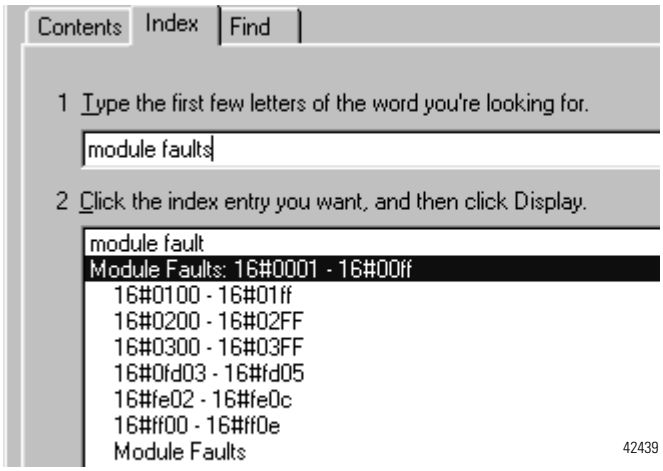


C. Identify the fault code.

1. Right-click the module and select *Properties*.
2. Click the *Connection* tab.



3. Identify the code for the fault.

Step:	Detailed actions:
D. Clear the fault.	1. From the *Help* menu, select *Contents*. 2. Click the *Index* tab. 3. Type *module faults*. 4.  4. Select the range for the code and click *Display*. 5. Scroll down to your fault code and follow the recommendations.
E. Go to step A.	

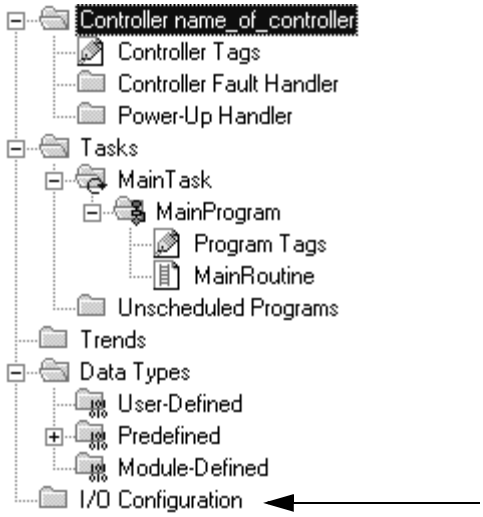
Does Another Controller Require the Data?

Multiple controllers can consume a produced tag:

If:	Then:
another controller requires the same data	Go to Add the Local 1756-ENBx or -ENET Module on page 5-4.
no other controller requires the data	You are done. Skip the rest of this procedure.

Add the Local 1756-ENBx or -ENET Module

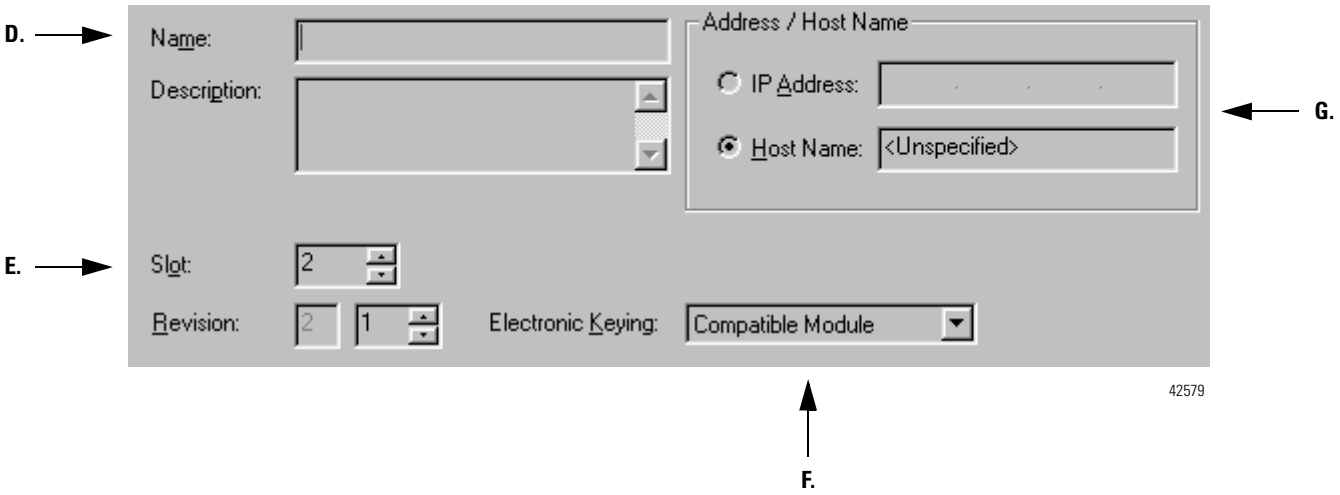
A. Open the RSLogix 5000™ project for the ControlLogix controller that sends the message.



B. Is the local ENB or ENET module already in the I/O configuration of the controller?

If:	Then:
yes	Go to Enter a Message
no	Right-click *I/O Configuration* and select *New Module*.

C. Select your type of ENB or ENET module and choose *OK*.



D. Type a name for the module.

E. Type or select the slot number where the module is installed.

F. How closely must any module that is installed in this slot match the information on this tab?

If:	Then select:	Notes:
all information must match: • type • catalog number • vendor • major and minor revision number	*Exact Match*	
all information *except* the minor revision number	*Compatible Module*	If you select *Compatible Module*, you can still replace a 1756-ENET/B module with a 1756-ENBT module. However, you *cannot* replace an ENBT module with an ENET/B module.
no information must match	*Disable Keying*	

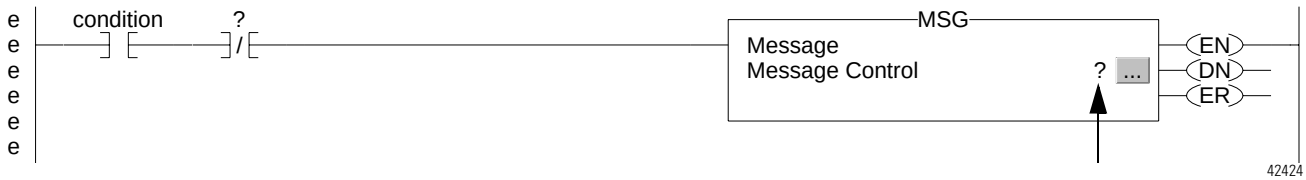
G. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	1. Select the *IP Address* button. 2. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

H. Click *Finish*.

Enter a Message

A. Enter a MSG instruction and associated input instruction (s).



B. In the MSG instruction, type a name for the message control tag and press the *Enter* key.

C. In the MSG instruction, right-click the message control tag and select *New* `tag_name.` (In older revisions of the software, the menu option is *Create* `tag_name.`)

D. From the *Scope* list, select `name_of_controller`*(controller)*, and click *OK*.

E. Enter `message.`EN.

where:

`message` is the message control tag from step B.

F. If your message is to a PLC-5® or SLC 500™ controller *and* it reads or writes integers (not REALs), use a buffer of INTs in the message.

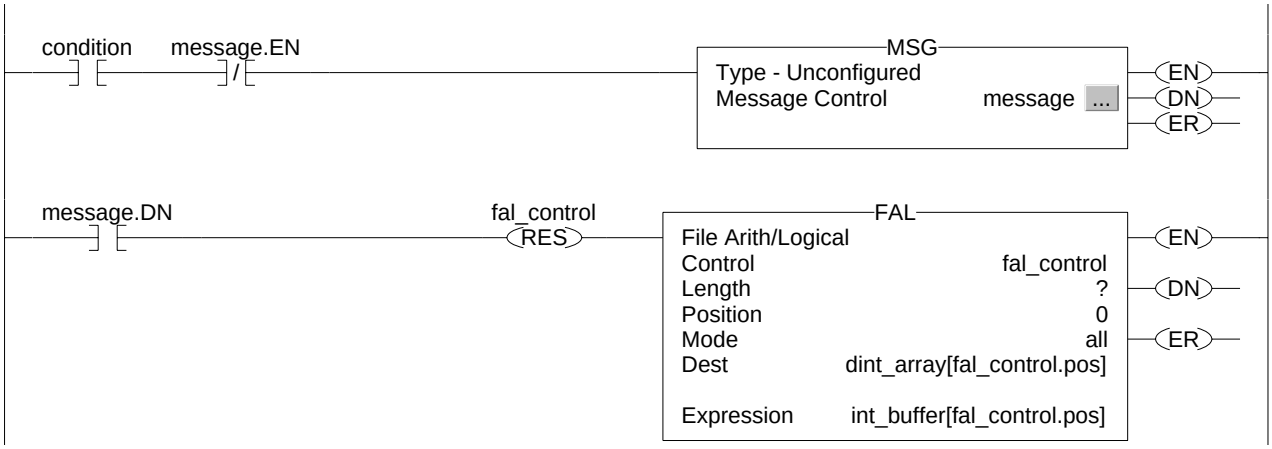
- ControlLogix controllers execute more efficiently and use less memory when working with 32-bit integers (DINTs). Use the DINT data type for integers whenever possible.
- PLC-5 and SLC 500 controllers require 16-bit integers.
- Use an INT buffer in the message and move the data into or out of the buffer as required.

The following examples show how to use a buffer of INTs

EXAMPLE

Read integers from a PLC-5 controller

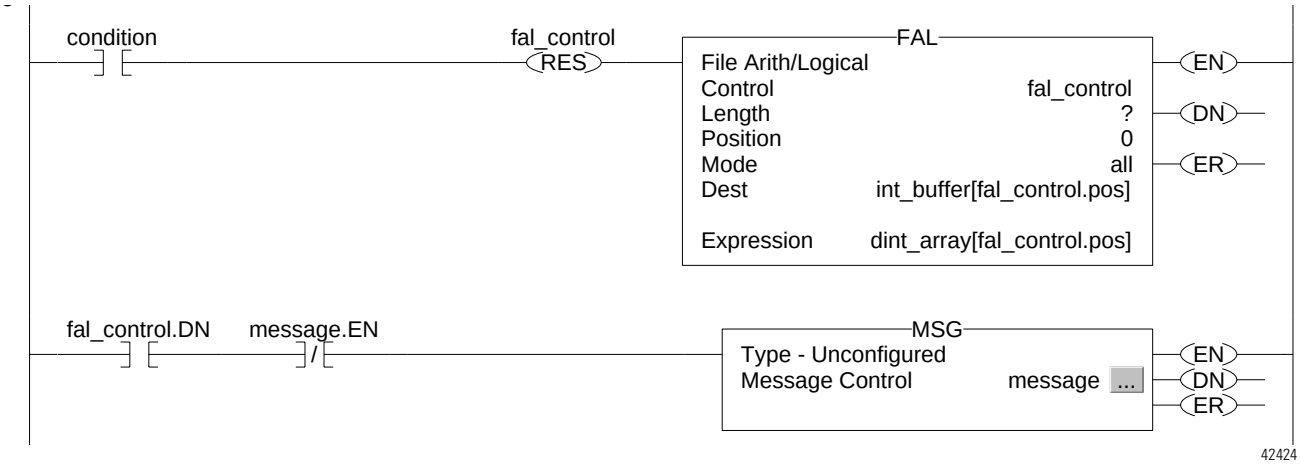
When *condition* turns on, reads 16-bit integer values (INTs) and stores them in *int_buffer*. Then the FAL instruction moves the values to *dint_array*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the ControlLogix controller.



EXAMPLE

Write integers to a PLC-5 controller

When *condition* turns on, moves the values in *dint_array* to *int_buffer*. This converts the values to 16-bit integers (INTs). Then the message instruction sends *int_buffer* to the other controller.



Where:	Is an:
dint_array	array of DINTs that are used in the ControlLogix controller
int_buffer	array of INTs with the same number of elements as *dint_array*

Configure the Message

A. In the MSG instruction, click ... .

B. Select a configuration for the message:

Table 5.A Message to a ControlLogix controller

If you want to:	For this item:	Type or select:
read (receive) the data	Message Type	*CIP Data Table Read*
	Source Element	first element of the tag that contains data in the other controller
	Number Of Elements	number of elements to transfer
	Destination Tag	first element of the tag (controller-scoped) in this controller for the data
write (send) the data	Message Type	*CIP Data Table Write*
	Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
	Number Of Elements	number of elements to transfer
	Destination Element	first element of the tag for the data in the other controller

Table 5.B Message to a SLC 500 controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., F8:0)

Table 5.C Message to a PLC-5 controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., F8:0)

C. Click the *Communication* tab.

D. Click *Browse …*

E. Is the other controller in the I/O configuration?

If:	Then:
Yes	1. Select the other controller and choose *OK*. 2. Go to step K.
No	Select the ENB or ENET module and choose *OK*.

F. In the *Path* text box, type a comma [,].

G. Type the port number from which the message exits:

For this port:	Specify:
backplane port from a 1756 controller or module	1
DF1 port from a 1756-L1 controller	2
ControlNet port from a 1756-CNB module	
EtherNet/IP port from a ENB or ENET module	
DH+ port over channel A from a 1756-DHRIO module	
DH+ port over channel B from a 1756-DHRIO module	3

H. Type a comma [,].

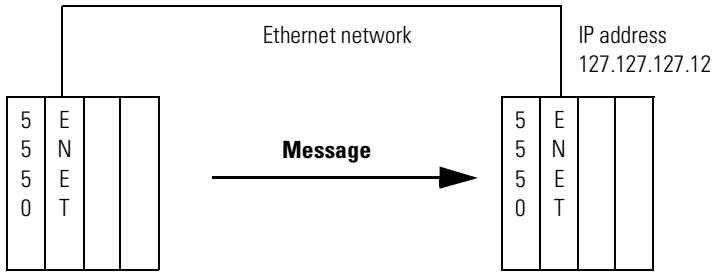
I. Type the address of the next hardware device (e.g., controller, module):

For a device on a:	Specify:
ControlLogix backplane	slot number
DF1 network	station address (0-254)
ControlNet network	node number (1-99 decimal)
DH+ network	8# followed by the node number (1-77 octal) For example, to specify an octal node address of 37, type 8#37
EtherNet/IP network	IP address (four decimal numbers separated by periods) or host name

J. Repeat steps F. through I. until you have specified the destination controller.

The following examples depicts a communication path:

EXAMPLE Communication path from a Logix5000 controller to a Logix5000 controller over an EtherNet/IP network



washer, 2, 127.127.127.12, 1, 0

where:	indicates:
washer	name of the ENB or ENET module
2	Ethernet port of the ENB or ENET module
127.127.127.12	IP address of the ENB or ENET module in the destination chassis
1	backplane port of the ENB or ENET module in the destination chassis
0	slot number of the destination controller

K. Complete the communication parameters:

<table>
<tr><th>If the message is to a:</th><th>Then:</th></tr>
<tr><td>PLC-5 controller
SLC 500 controller</td><td>1. Leave the CIP button selected.
2. Disregard the Cache Connection check box.</td></tr>
<tr><td>Logix5000 controller:
• ControlLogix controller
• FlexLogix controller</td><td>How many Logix5000 controllers does this controller send messages to?
If: | Then:
16 or less Logix5000 controllers | Leave the Cache Connection check box selected (checked).
more than 16 Logix5000 controllers | 1. Select16 Logix5000 controllers that require the most frequent messages.
2. Is this message to one of those controllers?
If: | Then
Yes | Leave the Cache Connection check box selected (checked).
No | Clear the Cache Connection check box.</td></tr>
</table>

L. Click *OK*.

Stagger the Messages

As you add messages to your project, you may have to coordinate the execution of the messages. To avoid errors and assure that each message is processed, follow these rules:

Rule 1:	Enable no more than 16 messages at one time (including block transfers).
Rule 2:	Enable no more than 10 of the following types of messages at one time: • CIP data table reads or writes that are *not* cached • CIP generic • PLC2, PLC3, PLC5, or SLC (all types) • block transfer reads or writes that are *not* cached

If the number of messages in your application exceeds rules 1 and 2, then stagger the execution of your messages. Here are some options:

- Send each message in sequence
- Send the messages in groups that are within the limits of rules 1 and 2

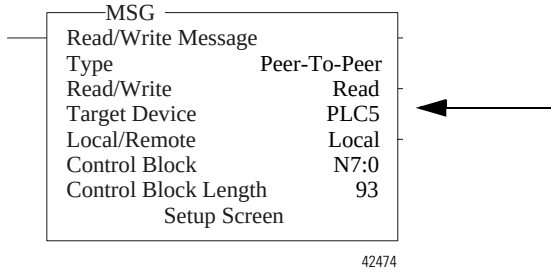
Access ControlLogix Data

Complete this task for any message that a PLC-5 or SLC 5/05 controller sends to a ControlLogix controller over an EtherNet/IP network.

IMPORTANT This procedure uses RSLogix 5™ or RSLogix 500™ software, revision 3.x.

A. Using either RSLogix 5 or RSLogix 500 software, as required, open the project for the PLC-5 or SLC 5/05 controller.

B. If the message is from a SLC 5/05 controller, in the MSG instruction, select *PLC5*.

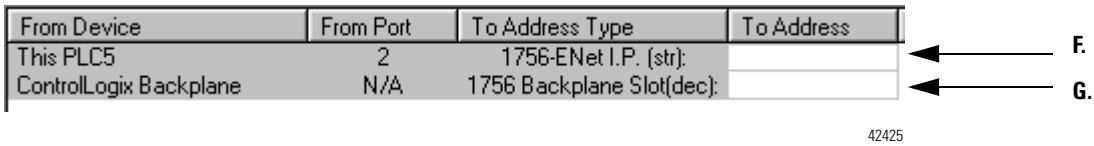


C. Display the set-up screen for the message.

D. Specify the following parameters:

If the controller is a:	For this section:	And this item:	Specify:
PLC-5	This PLC-5	Communication Command	*PLC-5 Typed Read* or *PLC-5 Typed Write*
		Data Table Address	starting address of the data in the PLC-5 controller
		Size in Elements	number of elements to read or write
		Port Number	2
	Target Device	Data Table Address	Type, in quotation marks [" "], the name of the tag in the ControlLogix controller (e.g., "count").
		MultiHop	Select *Yes*.
SLC 500	This Controller	Communication Command	*PLC5 Read* or *PLC5 Write*
		Data Table Address	starting address of the data in the SLC 500 controller
		Size in Elements	number of elements to read or write
		Channel	1
	Target Device	Data Table Address	Type, in quotation marks [" "], the name of the tag in the ControlLogix controller (e.g., "count").
		MultiHop	Select *Yes*.

E. Click the *MultiHop* tab.



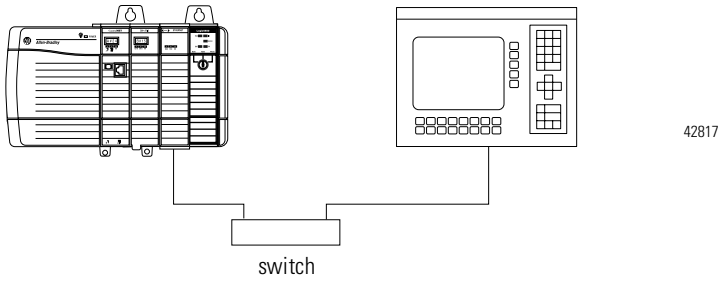
F. Type the IP address of the ENB or ENET module that is in the same chassis as the ControlLogix controller.

G. Type the slot number of the ControlLogix controller.

Communicate with a PanelView™ Terminal Over a EtherNet/IP Network

When to Use This Procedure

Use this procedure to exchange data between a PanelView terminal and a ControlLogix controller over a EtherNet/IP network.



Before You Begin

Before you use this procedure, do the following:

1. To produce and consume tags over an EtherNet/IP network, you must use a 1756-ENBx or -ENET/B module. If you have a 1756-ENET/A module, determine if you can update the module:

For this 1756-ENET/A revision:	Then:
1.18 or later (latch of the RJ--45 connector points to the left)	Update the firmware of module to revision 2.6 or later.
earlier than 1.18 (latch of the RJ--45 connector points to the right)	Contact your Rockwell Automation representative or local distributor.

2. Configure the ENB or ENET module in the local chassis. Refer to "Configure an EtherNet/IP Module" on page 1-1.

How to Use This Procedure

If you have not already done so in a previous procedure, do the following preliminary task:

- Add the Local 1756-ENBx or -ENET Module

To complete this procedure, do the following tasks:

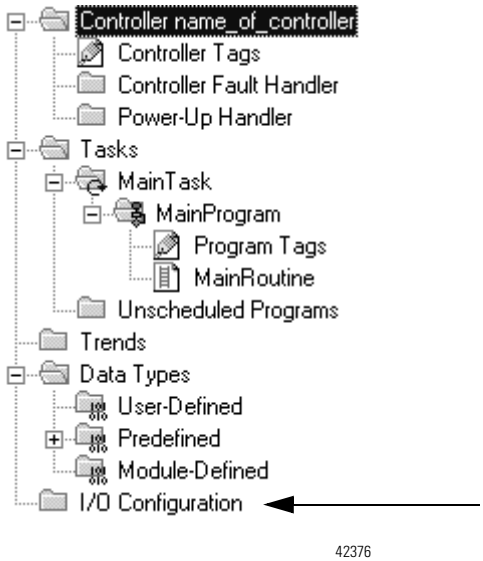
- Add the PanelView Terminal
- Organize Your Data
- Configure the PanelView Terminal
- Create PanelView Tags

To check your work, do the following task:

- Validate Connections

Add the Local 1756-ENBx or -ENET Module

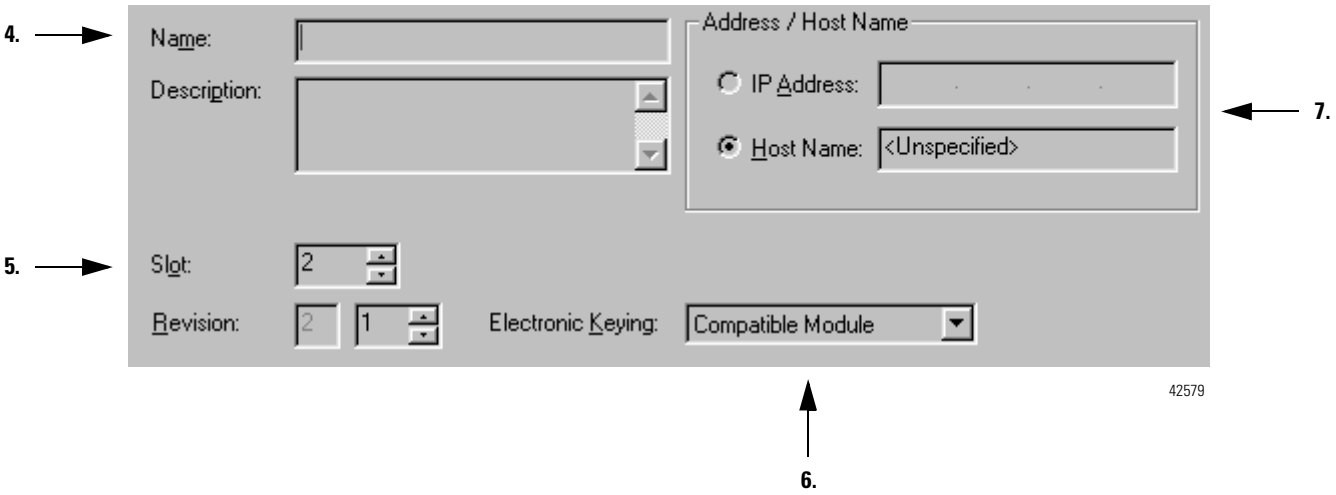
1. Open the RSLogix 5000™ project offline.



2. Is the local ENB or ENET module already in the I/O configuration of the controller?

If:	Then:
Yes	Go to Add the PanelView Terminal.
No	Right-click *I/O Configuration* and select *New Module*.

3. Select your type of ENB or ENET module and choose *OK*.



4. Type a name for the module.

5. Type or select the slot number where the module is installed.

6. How closely must any module that is installed in this slot match the information on this tab?

If:	Then select:	Notes:
all information must match: • type • catalog number • vendor • major and minor revision number	*Exact Match*	
all information *except* the minor revision number	*Compatible Module*	If you select *Compatible Module*, you can still replace a 1756-ENET/B module with a 1756-ENBT module. However, you *cannot* replace an ENBT module with an ENET/B module.
no information must match	*Disable Keying*	

7. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	A. Select the *IP Address* button. B. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

8. Click *Finish*.

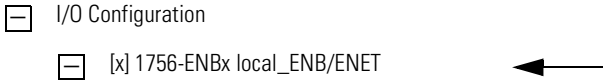
Add the PanelView Terminal

You can establish up to eight connections (instances) with each PanelView terminal. For example, one controller can use all eight instances. Or eight controllers can each use one instance.

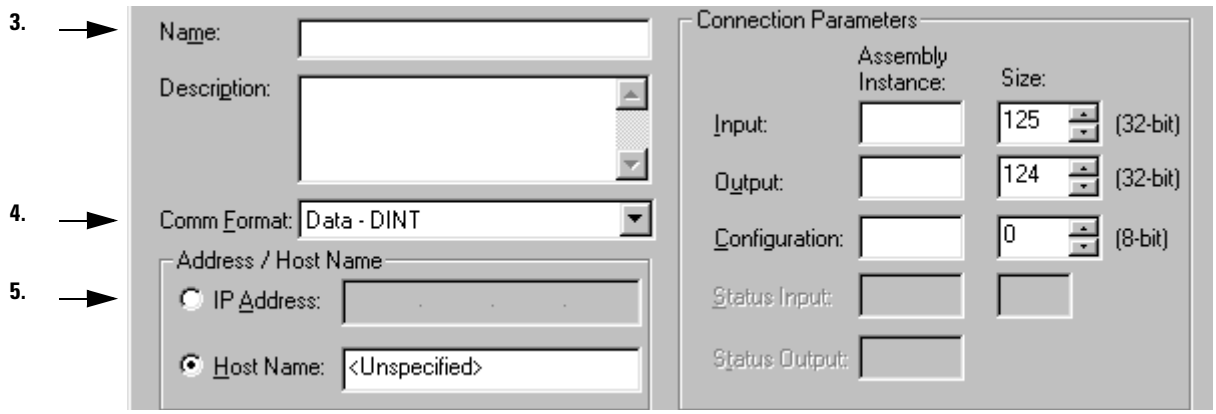
Each PanelView instance gives you:

- 100 DINTs of input data
- 100 DINTs of output data

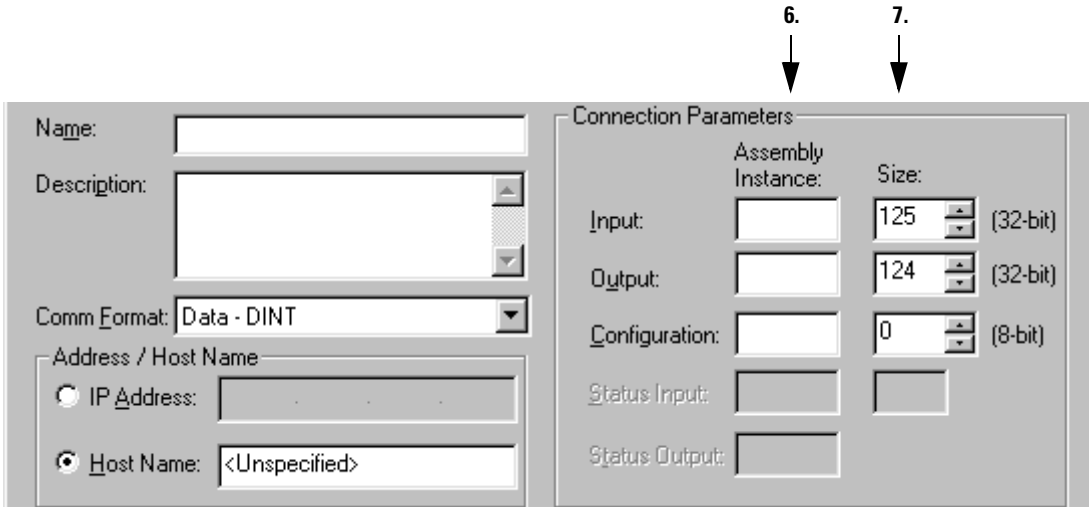
For each instance, complete the following steps:



1. Right-click `local_ENB/ENET` and select *New Module*.
2. Select *ETHERNET-MODULE* and choose *OK*.



3. Type a name for this PanelView instance.
4. Select *Data - DINT*.
5. Select the *IP Address* button and type the IP address of the PanelView terminal.



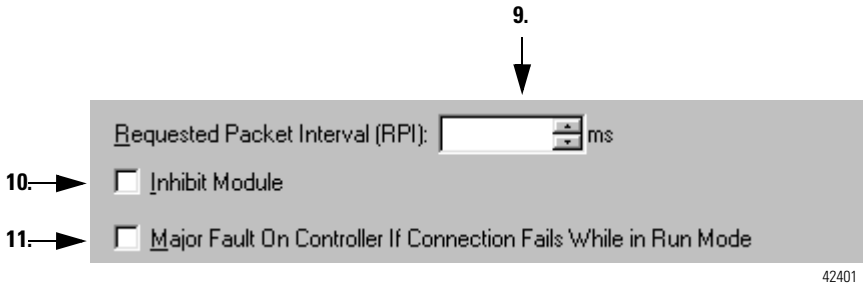
6. Type the assembly instance numbers for this PanelView instance.

For this instance number:	Type this Input Assembly Instance:	Type this Output Assembly Instance:	Type this Configuration Assembly Instance:
1	7	6	1
2	9	8	1
3	11	10	1
4	13	12	1
5	15	14	1
6	17	16	1
7	19	18	1
8	21	20	1

7. Type the following sizes for the input, output, and configuration data:

For this size:	Type:
Input	100
Output	100
Configuration	1

8. Click *Next*.



9. Type the rate that you want time-critical data to transfer with the PanelView terminal.

10. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

11. If communication with the modules fails, how do you want the controller to respond?

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

12. Click *Finish*.

Organize Your Data

Organize your data for the PanelView based on how the data is used.

For data that is:	Do this:
time-critical (e.g., controls a machine)	Use the I/O tags of the PanelView. The tags for this data were created when you added the PanelView to the I/O configuration of the controller. They are similar to the tags of I/O modules. See Table 6.A.
not time critical	Create arrays to store the data: 1. For each PanelView screen, create a BOOL array with enough elements for the bit-level objects on the screen. For example, the BOOL[32] array gives you 32 bits for push buttons, indicators, etc. 2. For each PanelView screen, create a DINT array with enough elements for the word-level objects on the screen. For example, the DINT[28] array, give you 28 values for numeric entry controls, numeric displays, etc.

To access the I/O tags of the PanelView, use the following address format:

Table 6.A Address format for the I/O tags of a PanelView

If the:	Then use this address:
PanelView writes the data	*name_of_panelview*:I.Data[*x*].*y*
PanelView reads the data	*name_of_panelview*:O.Data[*x*].*y*

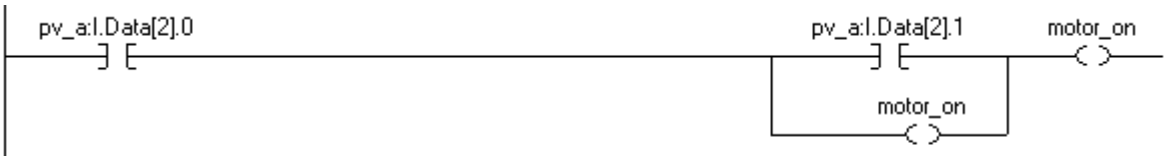
Where:	Is:
name_of_panelview	name of the PanelView instance in the I/O configuration of the controller
x	element of the PanelView input (I) or output (O) structure.
y	bit number within the input or output element

To address the PanelView data in your logic, you can have the following options:

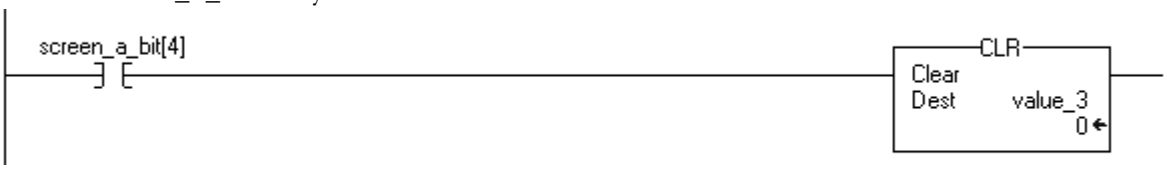
- address the tags directly
- copy the tags to other tags in your project
- create alias tags

EXAMPLE Address PanelView data

This rung uses these I/O tags of the PanelView: *pv_a:I.Data[2].0* and *pv_a:I.Data[2].1*. The rung controls a motor.

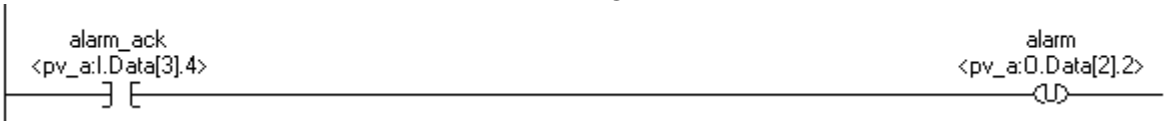


When a push button on the PanelView is pressed, this rung clears a value. The push button uses bit 4 of the *screen_a_bit* array.



This rung moves *counter.ACC* (a DINT value) to element 5 of the *screen_a_DINT* array. A numeric display on the PanelView shows the value.

alarm_ack and *alarm* are aliases for the I/O tags of the PanelView.



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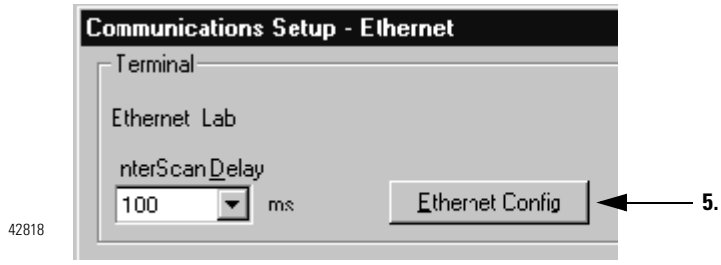
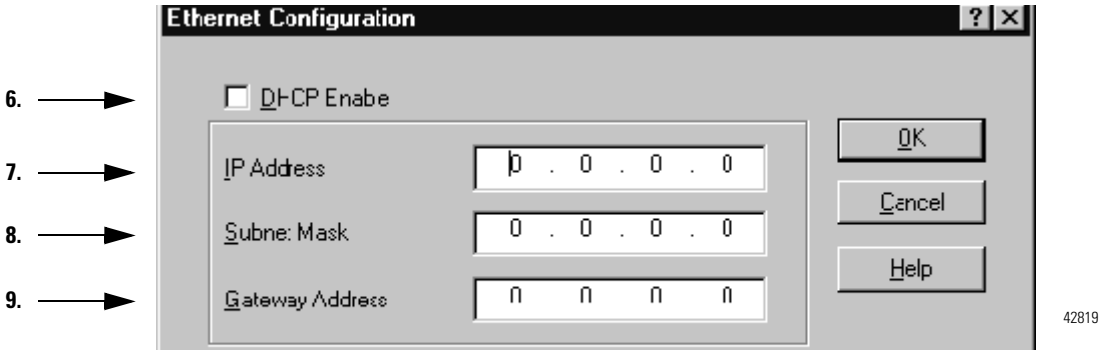
Configure the PanelView Terminal

1. Start PanelBuilder32 software.
2. Open an existing PanelBuilder application or create a new application.
3. From the *Application* menu, select *Settings*.
4. Click the *Comms Setup* button.

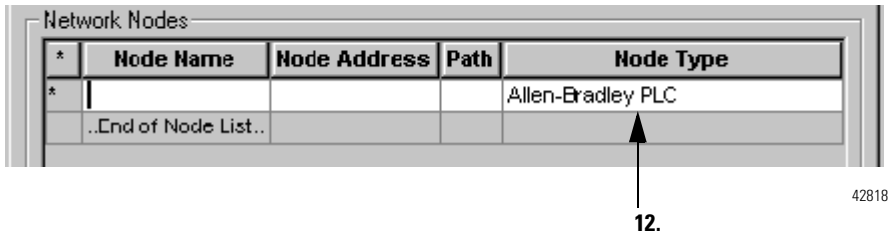


5. Click the *Ethernet Config* button.

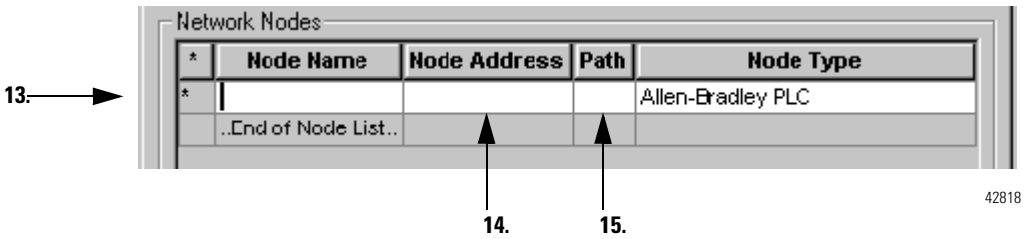


6. Clear (uncheck) the *DHCP Enable* check box.
7. Type the IP address of the PanelView terminal.
8. Type the subnet mask for the PanelView terminal, if necessary.
9. Type the gateway address for the PanelView terminal, if necessary.
10. Choose *OK*.

11. Under *Node Name*, right-click *End of Node List* and select *Insert Node*.



12. Select *ControlLogix5000*.



13. Type a name for the ControlLogix controller.

14. Type the IP address of the ENB or ENET module that is in the chassis with the controller.

15. Type the path to the ControlLogix controller. Use the following format:

space

```
1 controller_slot
```

where:

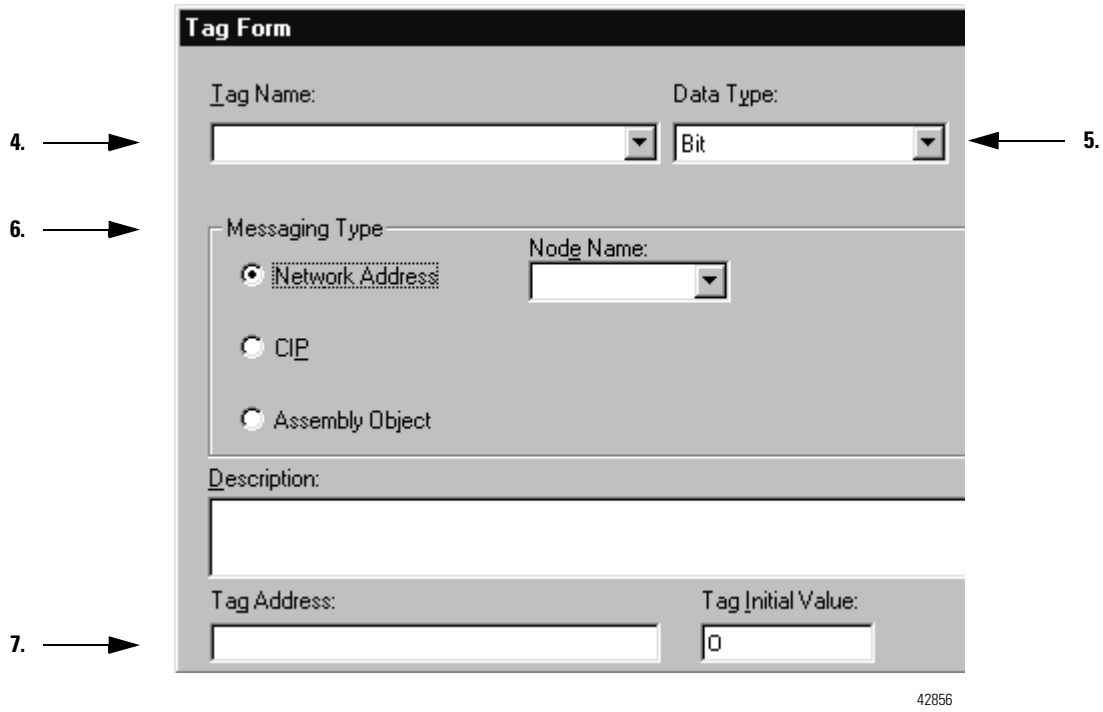
controller_slot is the slot number of the ControlLogix controller.

16. Click *OK*.

17. Click *OK*.

Create PanelView Tags

1. On the PanelView screen, create the required object.
2. Double-click the object.
3. Click the *Edit Tag* button.



4. Type a name for the object
5. In the ControlLogix controller, is the address of this tag a bit (BOOL) within an array of BOOLs?

If:	Then select:
Yes	*bit*
No	data type that matches the data type of the tag in the ControlLogix controller

6. Is this data time-critical (e.g., turn a machine on or off)?

If:	Then select:
No	*A. Network Address* B. From the *Node Name* list, select the controller.
Yes	*Assembly Object*

7. Specify the name of the tag in the ControlLogix controller:

If the message type is:	And its data type is:	And the:	Specify:
Network Address	→	→	*array_name[element]*
Assembly Object	bit	PanelView writes the data	AI*x:y/z*
		PanelView reads the data	AO*x:y/z*
	DINT	PanelView writes the data	AI*x:y*
		PanelView reads the data	AO*x:y*

Where:	Is:
array_name	name of the array in the controller
element	element number within the array
x	instance number of this connection with the controller

If the input assembly instance is:	And the output assembly instance is:	Then the instance number is:
7	6	1
9	8	2
11	10	3
13	12	4
15	14	5
17	16	6
19	18	7
21	20	8

y	element of the PanelView input or output structure in the controller
z	bit number within the input or output element

EXAMPLE Specify the address of a tag in the ControlLogix controller

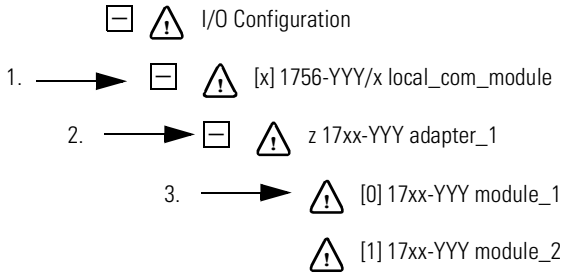
ControlLogix Controller:	PanelView Application:
name_of_panelview:I.Data[0].1	AI1:0/1
name_of_panelview:O.Data[3]	AO1:3
screen_a[5]	screen_a[5]

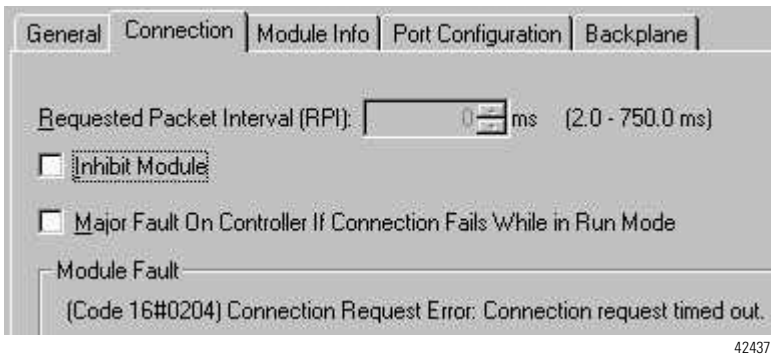
8. Click *OK*.

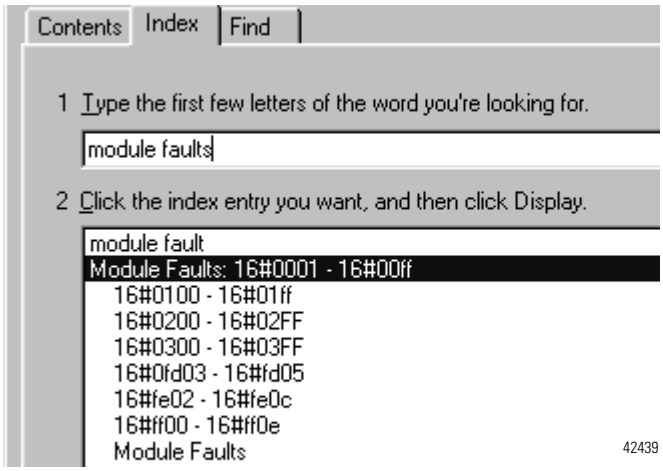
9. Click *OK*.

Validate Connections

Is this task, you verify that the controller can communicate with the devices that you have just configured.

Step:	Detailed actions:	
A. Determine if communications are established.	Is a ⚠ over the I/O Configuration folder?	
	If:	**Then:**
	No	The controller can communicate with the module.
	Yes	Communications are not established. Go to the next step.
B. Identify a fault. Start at the local communication module and work down through the tree.		
C. Identify the fault code.	1. Right-click the module and select *Properties*. 2. Click the *Connection* tab. 3. Identify the code for the fault.	



Step:	Detailed actions:
D. Clear the fault.	1. From the *Help* menu, select *Contents*. 2. Click the *Index* tab. 3. Type *module faults*. **4.**  4. Select the range for the code and click *Display*. 5. Scroll down to your fault code and follow the recommendations.
E. Go to step A.	

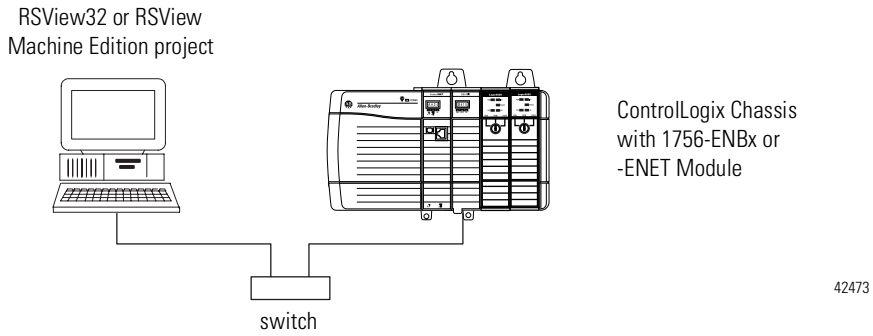
Notes:

Communicate with an RSView Project over an EtherNet/IP Network

When to Use This Procedure

Use this procedure to communicate with tags in either of the following types of RSView projects:

- RSView32 project.
- RSView Machine Edition project (developed with RSView Studio software)



How to Use This Procedure

IMPORTANT Before you use this procedure, configure the 1756-ENBx or -ENET module that is in the chassis with the controller. Refer to "Configure an EtherNet/IP Module" on page 1-1.

To communicate with an RSView project, you have two options:

If the data:	Then use a:
needs regular delivery at a rate that you specify	polled message
is sent when a specific condition occurs in your application	unsolicited message

Configure an Ethernet Driver

In this task, you configure an RSLinx driver to communicate with devices on an EtherNet/IP network. You can configure the driver to communicate with up to 63 devices on this network, such as 1756-ENET modules or PLC-5E controllers.

A. Go to RSLinx software.

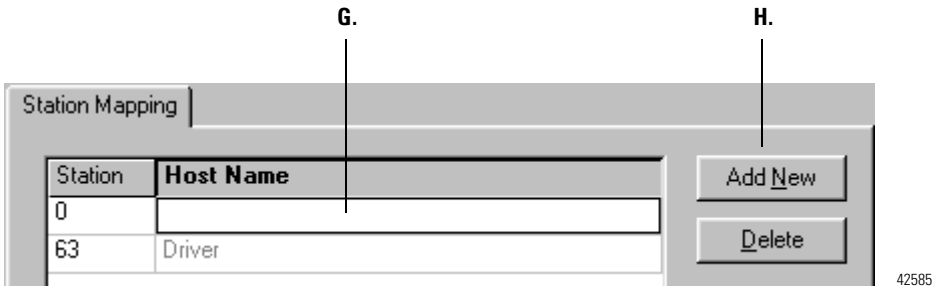
B. From the *Communications* menu, choose *Configure Drivers*.

C. From the *Available Driver Types* list, choose *Ethernet devices*.

D. Choose *Add New*.

E. If you want assign a descriptive name to the driver, change the default name.

F. Choose *OK*.



G. In the *Host Name* column, type the IP address or host name of an EtherNet/IP device with which you want to communicate.

Examples:

- aurora6
- 130.151.136.164

H. Do you want to communicate with another EtherNet/IP device on this network?

If:	Then:
Yes	1. Choose *Add New*. 2. Go to Step G.
No	Go to the next step.

I. Choose *OK*.

J. Choose *Close*.

Select a Communication Method

Select a method for transferring the data:

If the data:	Then go to:
needs regular delivery at a rate that you specify	"Create a Polled Topic" on page 7-4
is sent when a specific condition occurs in your application	"Create a Unsolicited Topic" on page 7-14

Create a Polled Topic

TIP

RSLogix 5000 software, revision 10.0 or later, automatically creates DDE/OPC topics in RSLinx software whenever you:

- create a project
- save a project
- change the revision of a project to 10.0 or later

In some cases, you have to update the data source for the topic in RSLinx software, as shown in steps E - G of this section.

A. Display RSLinx software.

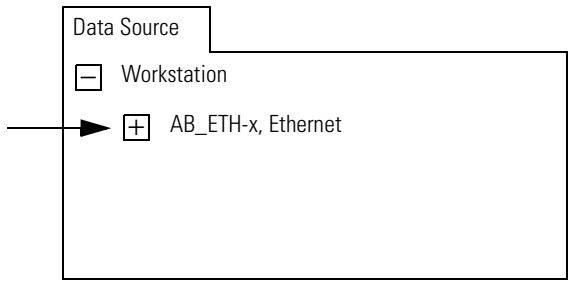
B. From the *DDE/OPC* menu, select *Topic Configuration …*

C. In the bottom left corner of the window, click *New*.

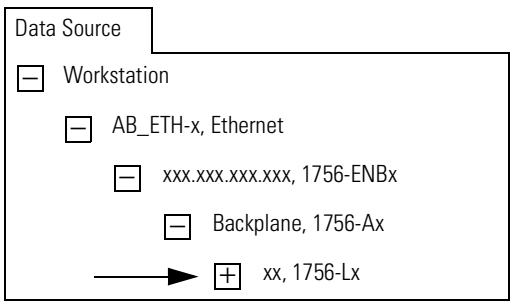
D. Type a name for the topic and press the *Enter* key.

To expand a network one level, do one of the following:

- Double-click the network.
- Select the network and press the → key.
- Click the + sign.



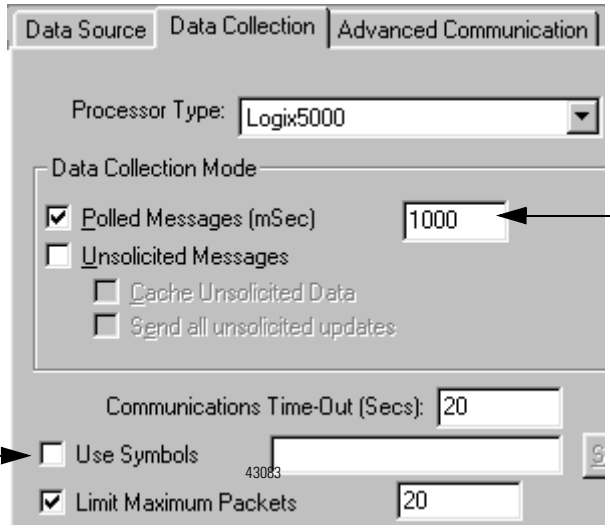
E. On the *Data Source* tab, expand the *AB_ETH-x* driver until you see the ControlLogix controller.



F. Select the ControlLogix controller.

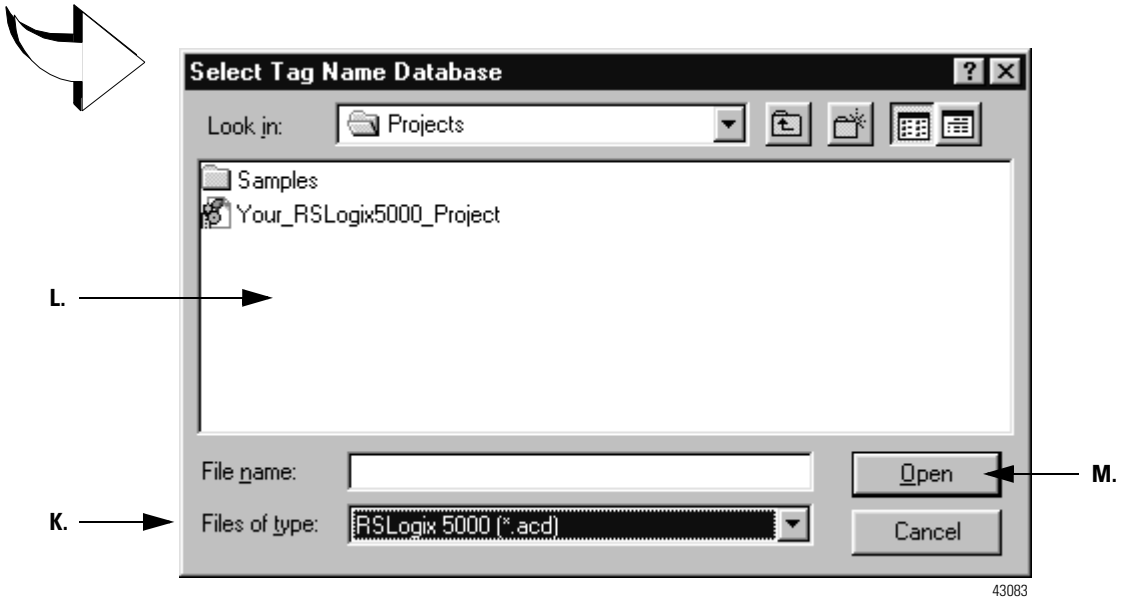
G. Choose *Apply* and confirm the update.

H. Click the *Data Collection* tab.



I. Type the update rate (ms) for the data.

J. Click the *Use Symbols* check box.



K. Select *RSLogix 5000 (*acd)*.

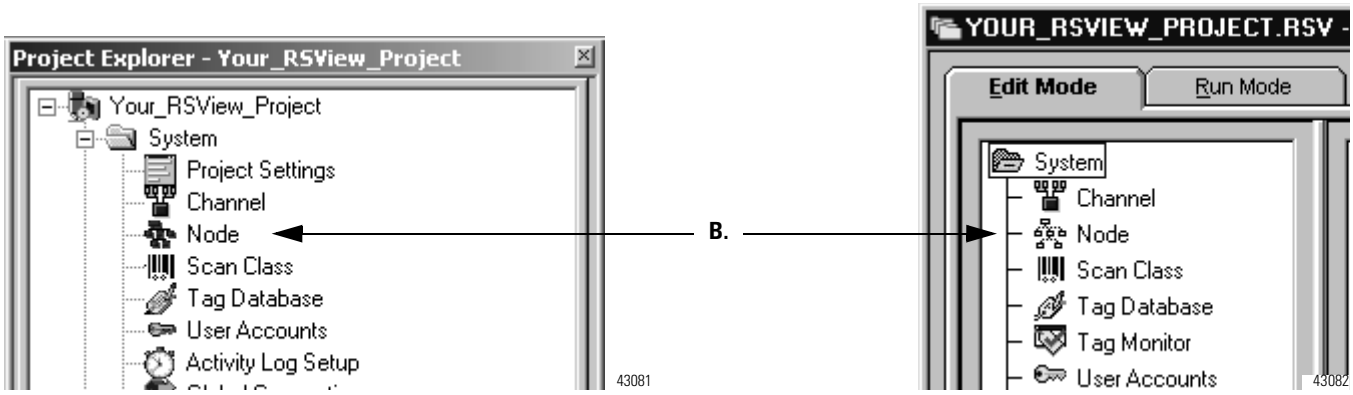
L. Select the RSLogix 5000 project for this topic.

M. Choose *Open*.

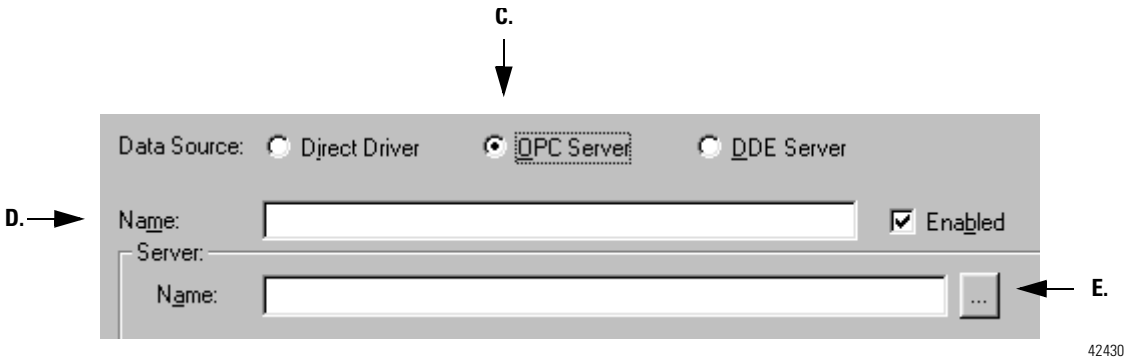
N. Choose *Done* and then *Yes*.

Create a Polled Node

A. Open the RSView project.



B. Double-click *Node*.



C. Click *OPC Server*.

D. Type a name for the node.

E. Click ....

F. Select *RSLinx OPC Server* and click *OK*.

G. Click *Accept*.

H. Click *Close*.

Import Logix5000 Tags

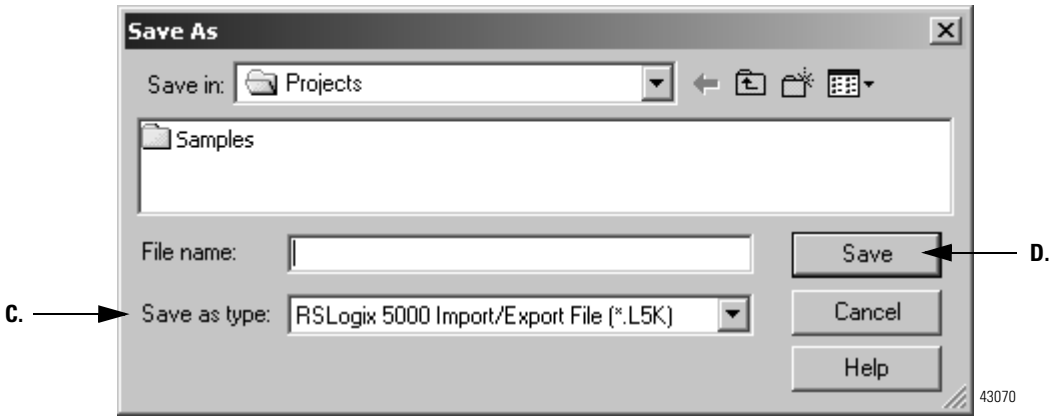
To import tags from an RSLogix 5000 project into your RSView project, use the Logix 5000 Tag Import utility:

- Create an .L5K File
- Install the Logix 5000 Tag Import Utility
- Use the Utility to Create a .CSV File
- Import the .CSV File

Create an .L5K File

A. Open the RSLogix 5000 project that contains the tags that you want to access.

B. From the *File* menu, choose *Save As*.



C. Select *RSLogix 5000 Import/Export File (*.L5K)*.

D. Choose *Save*.

Install the Logix 5000 Tag Import Utility

A. Get your RSLogix 5000 software CD.

B. On the CD, find the following file:

language \Tools\Tag Import Utility\Logix+5000+Tag+Import.msi.

where:

language is the language of your software. For example, for software that is in English, open the Enu folder.

C. Copy the file to your computer.

D. To install the utility, open the file.

Use the Utility to Create a .CSV File

A. Start the Logix 5000 Tag Import utility.

B. Type the name of the node from "Create a Polled Node."

C. Select the .L5K file.

D. Choose *Search*.

E. Select the tags to import.

F. Type the name of the topic from "Create a Polled Topic."

G. Choose *OK*.

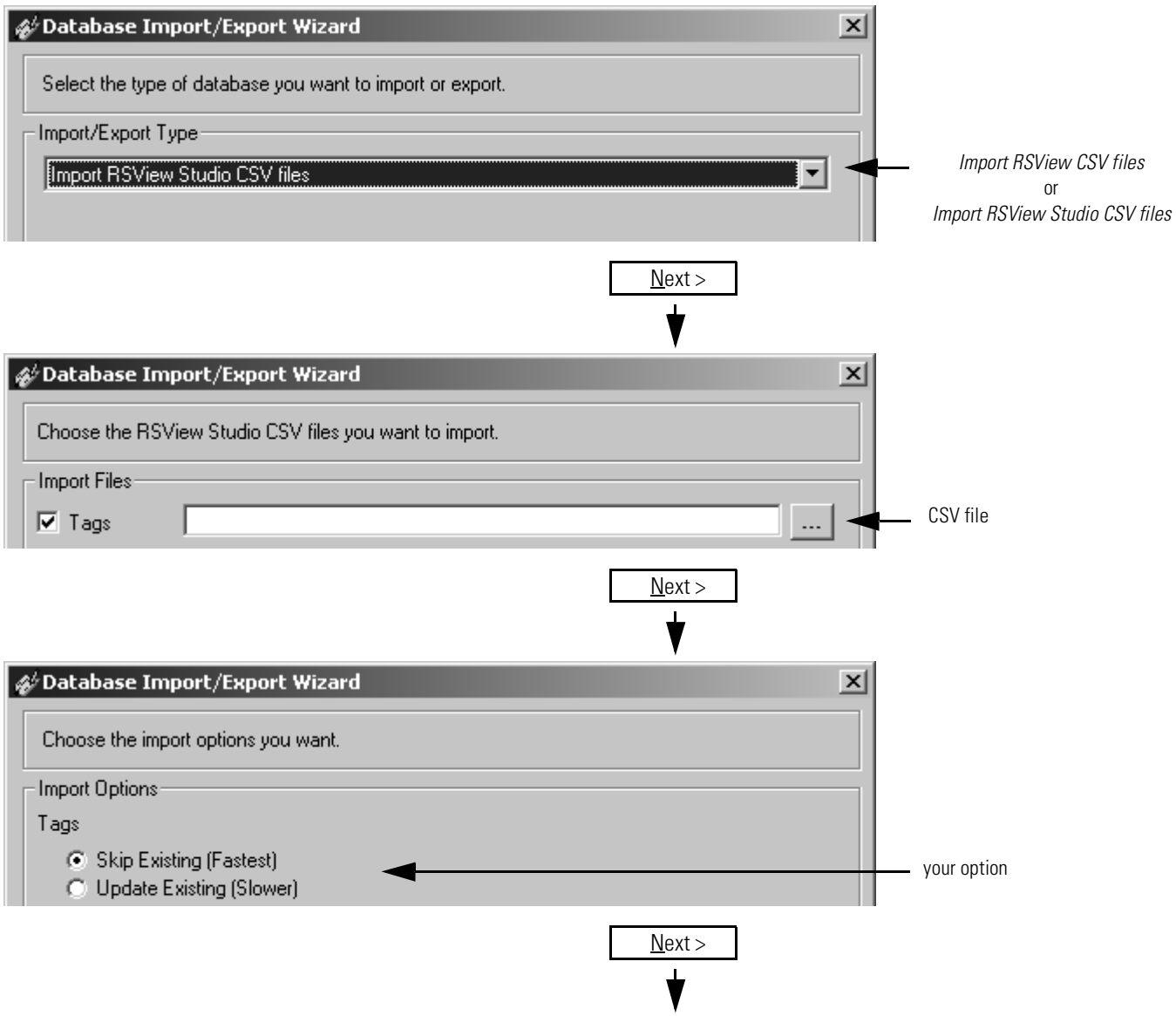
H. Choose *Save*.

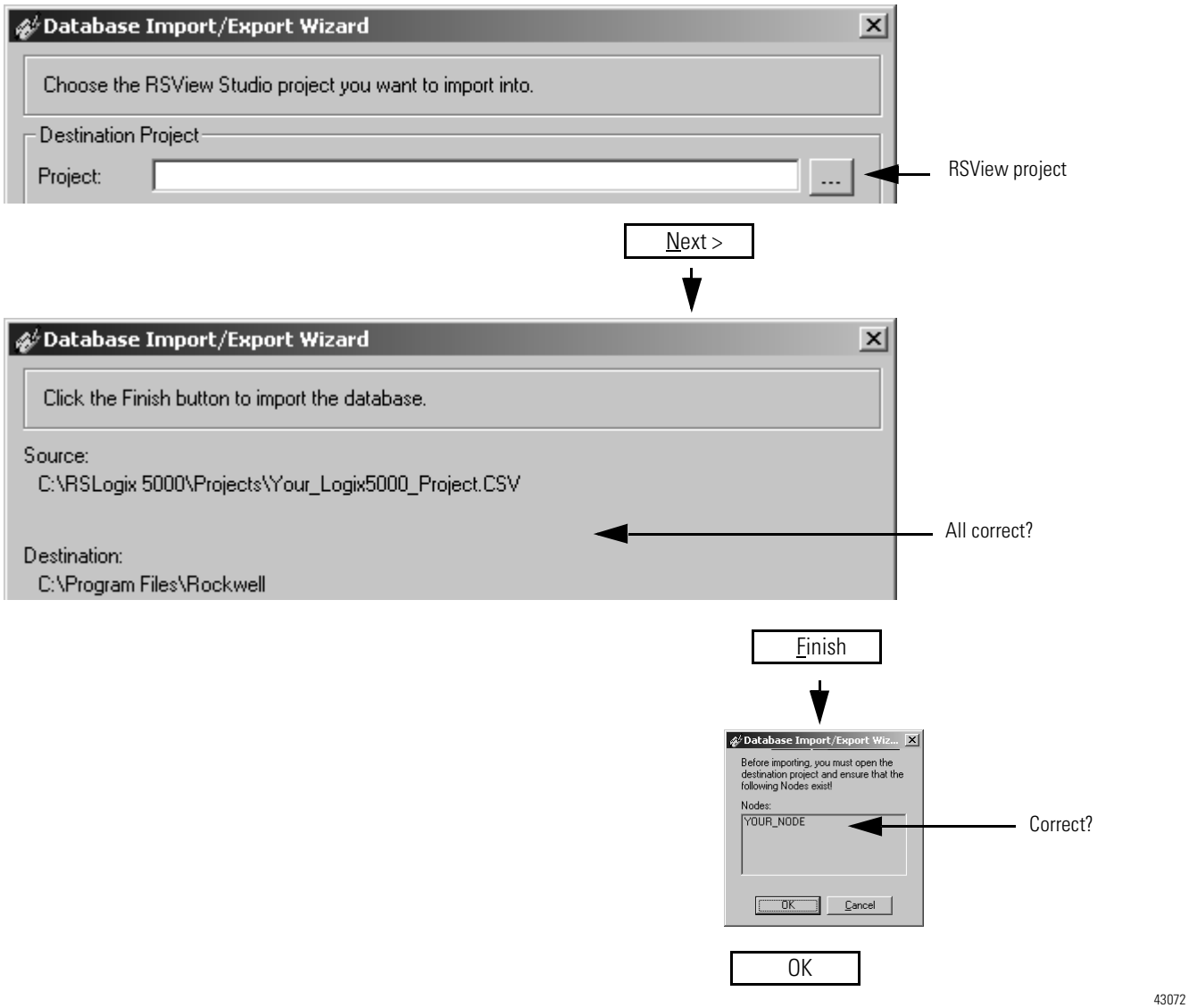
Import the .CSV File

A. Start the Database Import & Export wizard:

- Start ⇒ Programs ⇒ Rockwell Software ⇒ RSView Studio Tools ⇒ Database Import & Export Wizard
- Start ⇒ Programs ⇒ Rockwell Software ⇒ RSView32 Tools ⇒ Database Import & Export Wizard

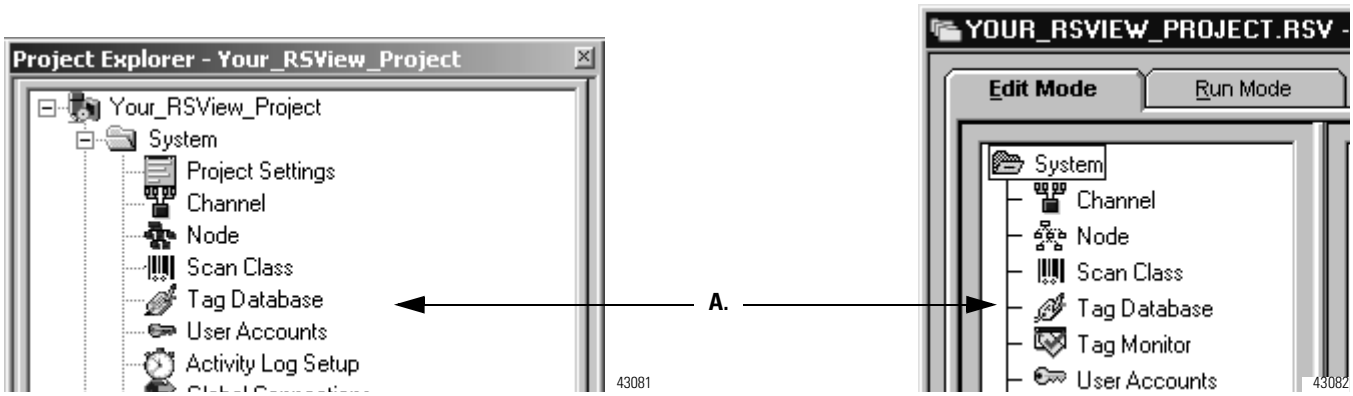
B. Complete the screens of the wizard:




Database Import/Export Wizard
Choose the RSView Studio project you want to import into.
Destination Project
Project:
...
RSView project
Next >
Database Import/Export Wizard
Click the Finish button to import the database.
Source:
C:\RSLogix 5000\Projects\Your_Logix5000_Project.CSV
Destination:
C:\Program Files\Rockwell
All correct?
Finish
Database Import/Export Wiz...
Before importing, you must open the destination project and ensure that the following Nodes exist!
Nodes:
YOUR_NODE
OK
Cancel
Correct?
OK
43072

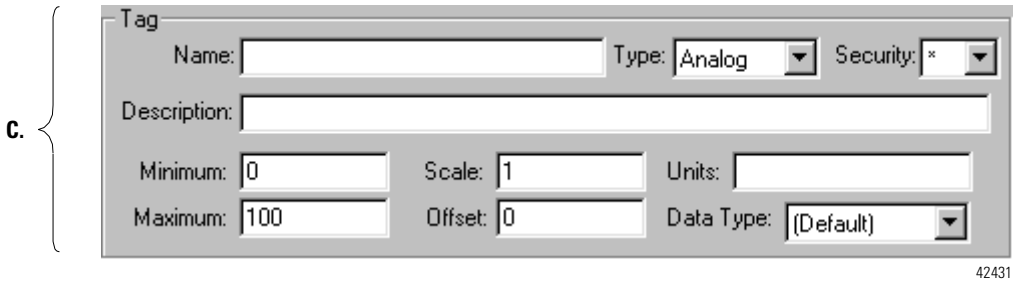
Create a Polled Tag

To create RSView tags one tag at a time:

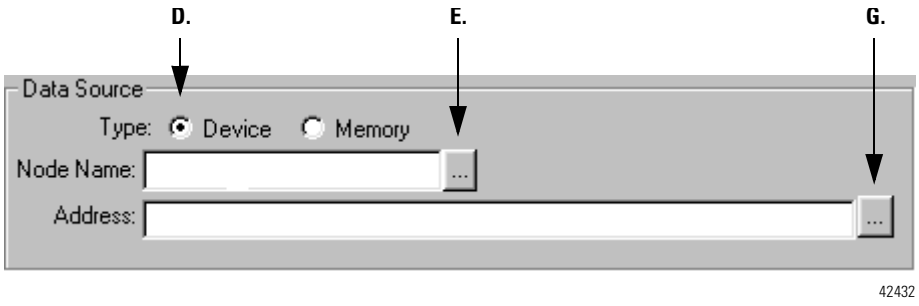


A. Double-click *Tag Database*.

B. Click *New*.



C. Specify the properties of the tag.



D. Click *Device*.

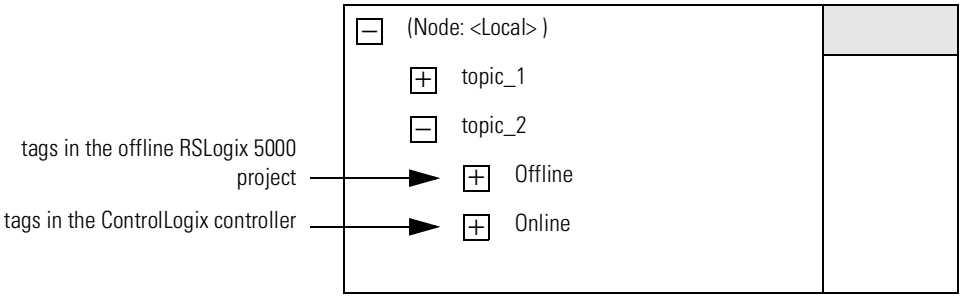
E. Click ....

F. Select the name of the node that you created in "Create a Polled Node" and click *OK*.

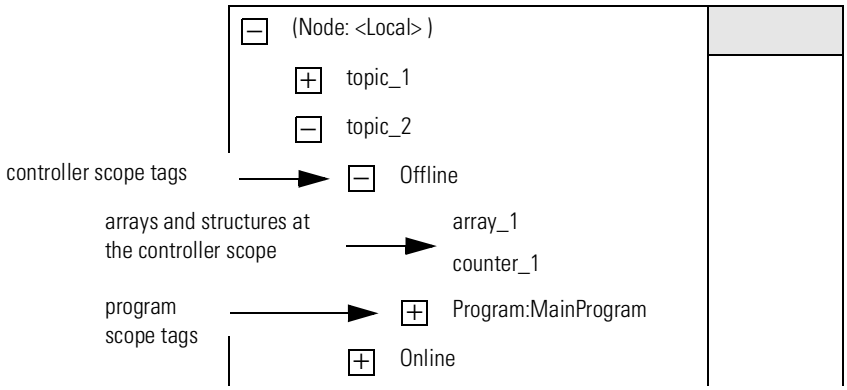
G. Click ....

H. Click the + sign.

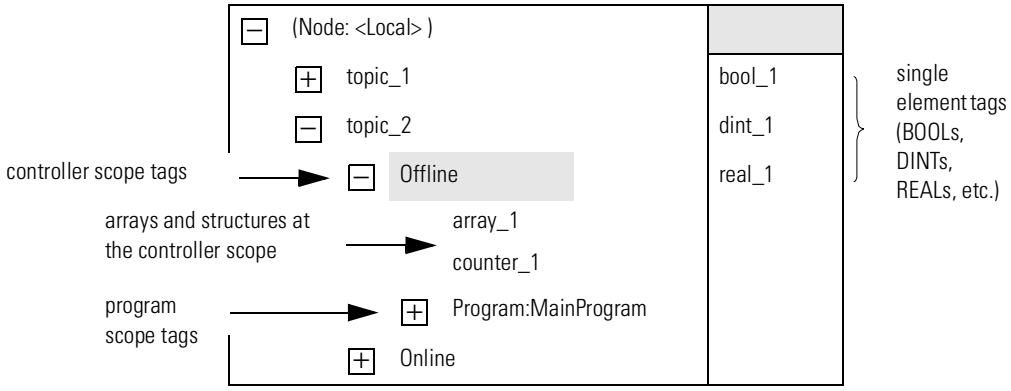
I. Next to the topic from "Create a Polled Topic," click the + sign.



J. Next to *Offline*, click the + sign.



K. On the left, select the entry that contains the required tag (address).



L. On the right, double-click the tag that contains the required data (i.e., the address for the RSView tag).

M. Click *Accept*.

N. If this is an RSView32 project, go to Validate an RSView32 Tag.

Create a Unsolicited Topic

A. Display RSLinx software.

B. From the *Communications* menu, select *Configure Client Applications*.

C. Click the *Virtual Link ID* tab.

D. Do you want to use the same Virtual Link ID for each workstation in your system? (Node or IP addresses are sufficient to distinguish between workstations.)

If:	Then:
Yes	1. Record the Virtual Link ID number, which you will use in subsequent steps. 2. Click *OK*.
No	1. Enter a unique Virtual Link ID for the workstation. 2. Click *OK*. 3. Close the RSLinx software. (If you configured RSLinx software to start as a service, you must also stop the service.) 4. Re-open the RSLinx software.

E. From the *DDE/OPC* menu, select *Topic Configuration …*

F. In the bottom left corner of the window, click *New*.

G. Type a name for the topic and press the *Enter* key.

H. Click the *Data Collection* tab.

I. Specify the following parameters:

For this item:	Do this:
Processor Type	Select *PLC-5*.
Data Collection Mode	1. Clear the *Polled Messages* check box. 2. Select the *Unsolicited Messages* check box.

J. Click the *Advanced Communication* tab.

K. Specify the following parameters:

For this item:	Type or select:
Communication Driver	driver for the network across which you will send the message
Station	slot number of the controller that is sending the message
Local or Remote Addressing	*Remote*

L. In the *Remote Routing Configuration* dialog box, specify the following parameters:

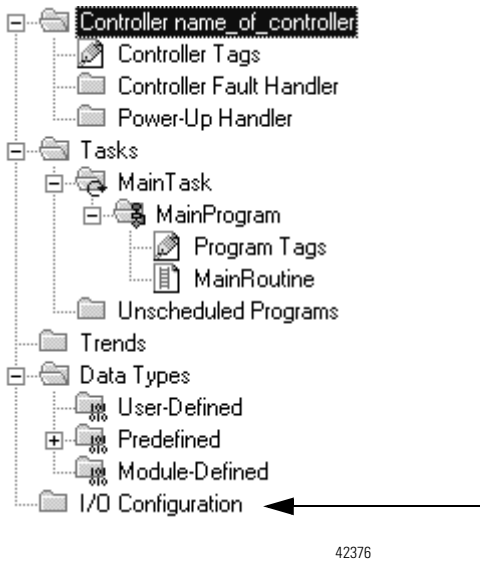
For this parameter:	Type or select:
Bridge Device	*1785-KA5 Bridge/5130-KA*
Local ID	Virtual Link ID from Step D.
Local KA5	arbitrary number between 1 and 107 (RSLinx requires an entry but this configuration does *not* use the entry.)
Remote ID	number that designates the backplane of the ControlLogix chassis (Use a different number for each backplane.)

M. Click *OK*.

N. Click *Done* and confirm the update of the topic.

Add the 1756-ENBx or -ENET Module

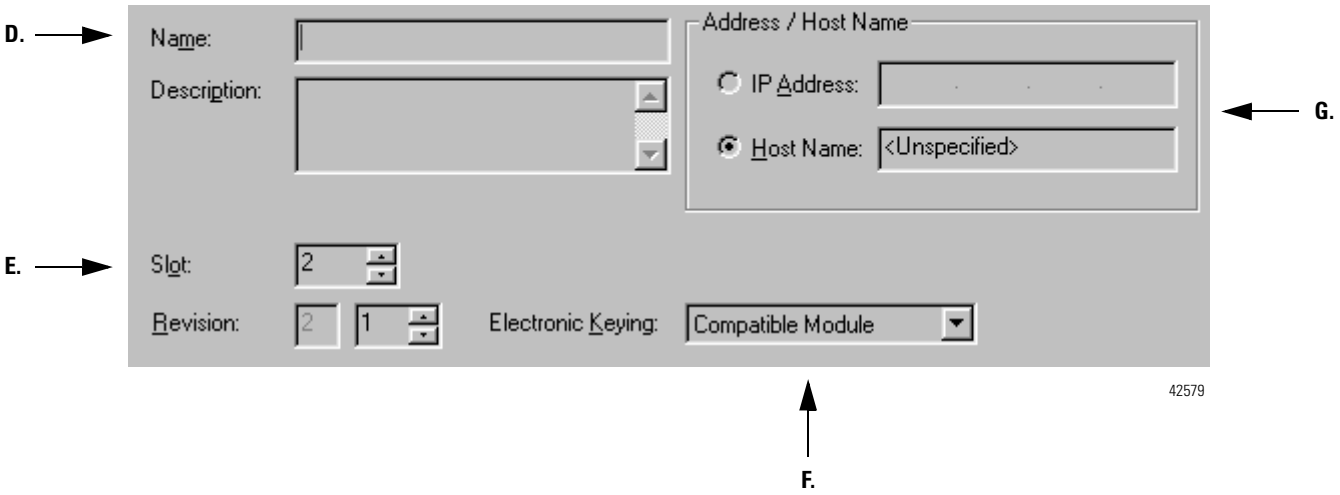
A. Open the RSLogix 5000™ project offline.



B. Is the local ENB or ENET module already in the I/O configuration of the controller?

If:	Then:
yes	Go to Enter a Message
no	Right-click *I/O Configuration* and select *New Module*.

C. Select your type of ENB or ENET module and choose *OK*.



D. Type a name for the module.

E. Type or select the slot number where the module is installed.

F. How closely must any module that is installed in this slot match the information on this tab?

If:	Then select:	Notes:
all information must match: • type • catalog number • vendor • major and minor revision number	*Exact Match*	
all information *except* the minor revision number	*Compatible Module*	If you select *Compatible Module*, you can still replace a 1756-ENET/B module with a 1756-ENBT module. However, you *cannot* replace an ENBT module with an ENET/B module.
no information must match	*Disable Keying*	

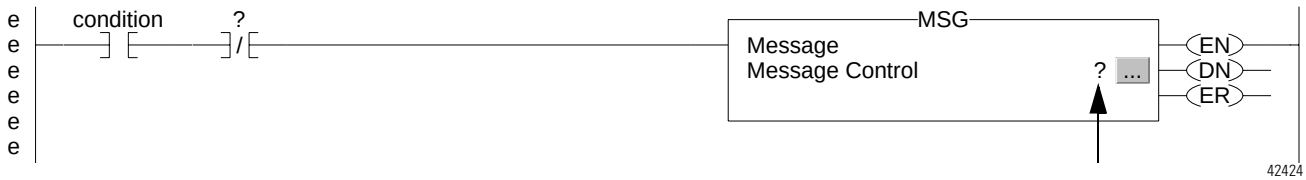
G. Type the IP address or host name of the module:

To specify an:	Do this:	Example:
IP address	1. Select the *IP Address* button. 2. Type the IP address	130.151.136.164
host name	Type the host name	aurora6

H. Click *Finish*.

Enter a Message

A. Enter a MSG instruction and associated input instruction (s).



B. In the MSG instruction, type a name for the message control tag and press the *Enter* key.

C. In the MSG instruction, right-click the message control tag and select *New* `tag_name.` (In older revisions of the software, the menu option is *Create* `tag_name.`)

D. From the *Scope* list, select `name_of_controller`*(controller)*, and click *OK*.

E. Enter `message.`EN.

where:

`message` is the message control tag from step B.

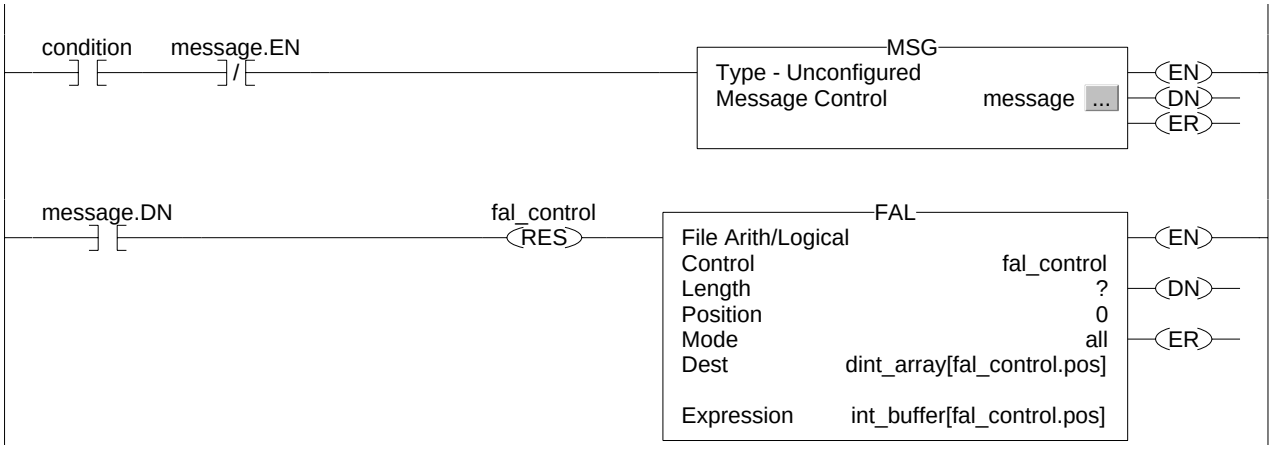
F. If your message reads or writes integers (not REALs), use a buffer of INTs in the message.

- ControlLogix controllers execute more efficiently and use less memory when working with 32-bit integers (DINTs). Use the DINT data type for integers whenever possible.
- In this procedure, you use a PLC-5 Typed Read or PLC-5 Typed Write message, which requires 16-bit integers.
- Use an INT buffer in the message and move the data into or out of the buffer as required.

The following examples show how to use a buffer of INTs

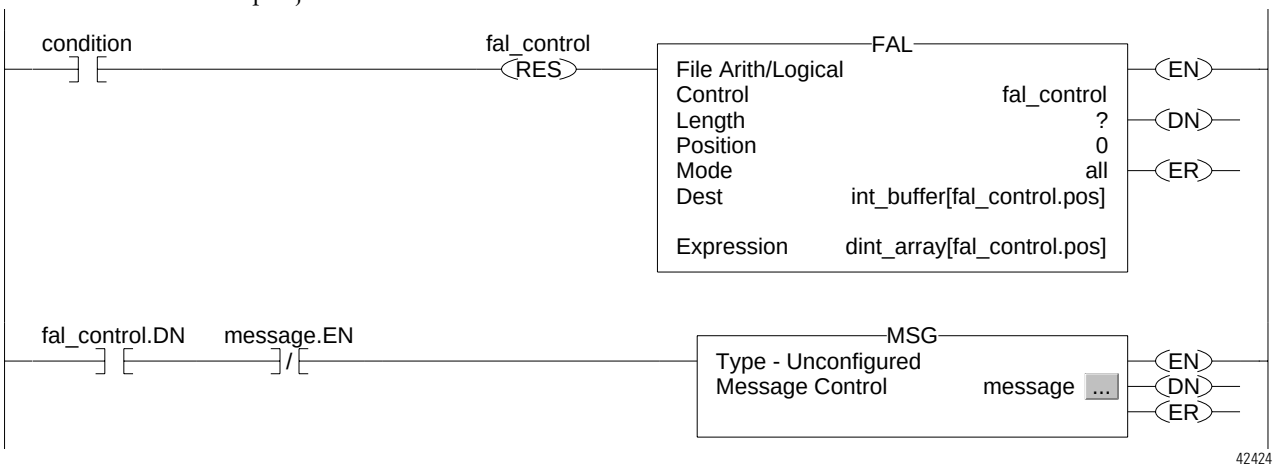
EXAMPLE Read integers from an RSView project

When *condition* turns on, reads 16-bit integer values (INTs) and stores them in *int_buffer*. Then the FAL instruction moves the values to *dint_array*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the ControlLogix controller.



EXAMPLE Write integers to an RSView project

When *condition* turns on, moves the values in *dint_array* to *int_buffer*. This converts the values to 16-bit integers (INTs). Then the message instruction sends *int_buffer* to the RSView project.



Where:	Is an:
dint_array	array of DINTs that are used in the ControlLogix controller
int_buffer	array of INTs with the same number of elements as *dint_array*

Configure the Message

A. In the MSG instruction, click ....

B. On the Configuration tab, specify the following parameters:

Table 7.1 Message to a RSView project

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	logical address, such as N7:0
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	logical address, such as N7:0
floating-point (REAL)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	logical address, such as F8:0
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	logical address, such as F8:0

C. Click the *Communication* tab.

D. Click *Browse …*

E. Select the ENB or ENET and click *OK*.

F. In the *Path* text box, add:

, 2, `address`

where:

`address` is the IP address or DNS name of the workstation.

EXAMPLE Complete path entry

washer_chassis, 2, 130.130.128.4

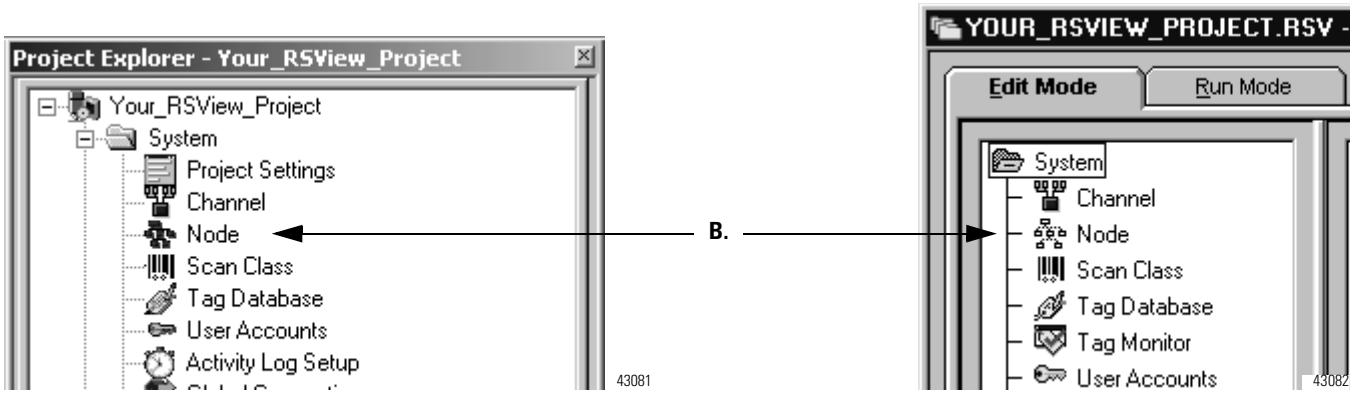
G. On the *Communication* tab, specify the following parameters:

For this item:	Type or select:
Communication Method	*CIP With Source ID*
Source Link	Remote ID from "Create a Unsolicited Topic, step L."
Destination Link	Virtual Link ID from "Create a Unsolicited Topic, step D."
Destination Node	77 (RSLinx reserves node 77 for DDE topics.)

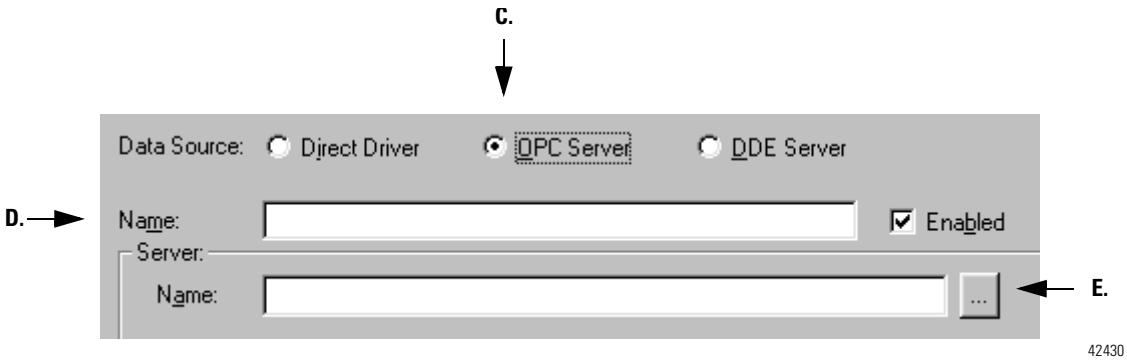
H. Click *OK*.

Create an Unsolicited Node

A. Open the RSView project.



B. Double-click *Node*.



C. Click *OPC Server*.

D. Type a name for the node.

E. Click ....

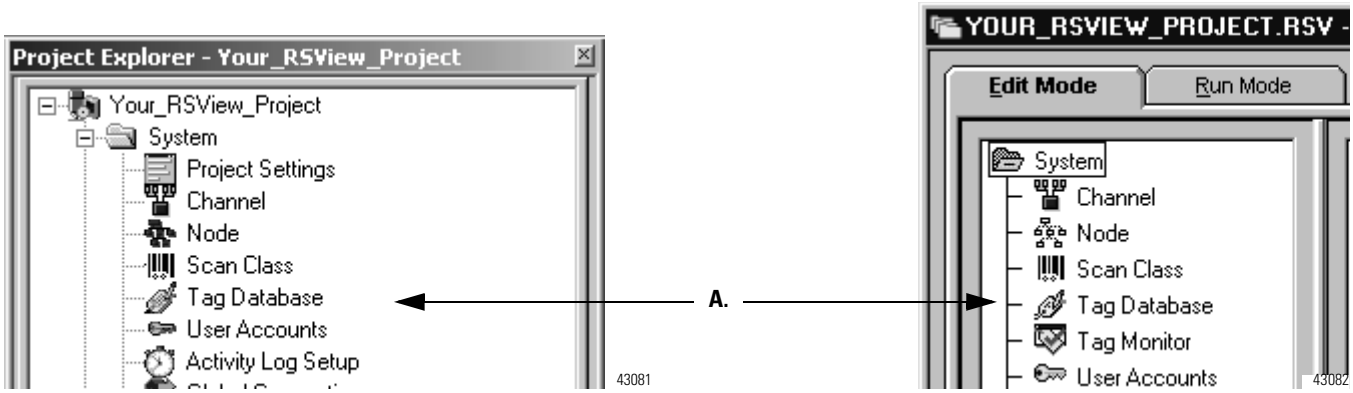
F. Select *RSLinx OPC Server* and click *OK*.

G. In the *Access Path* box, type the name of the topic from "Create a Unsolicited Topic."

H. Click *Accept*.

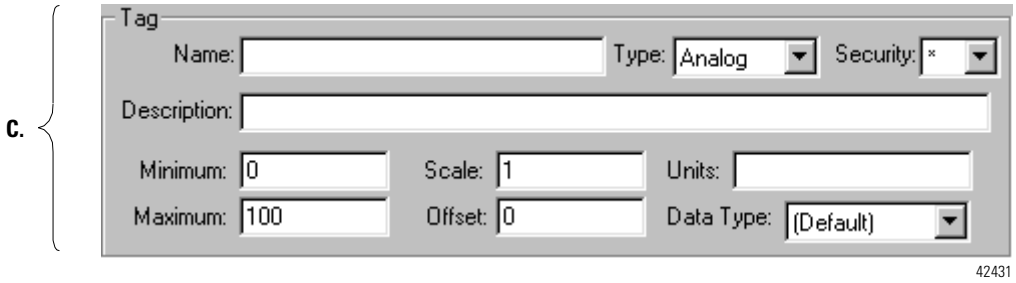
I. Click *Close*.

Create an Unsolicited Tag

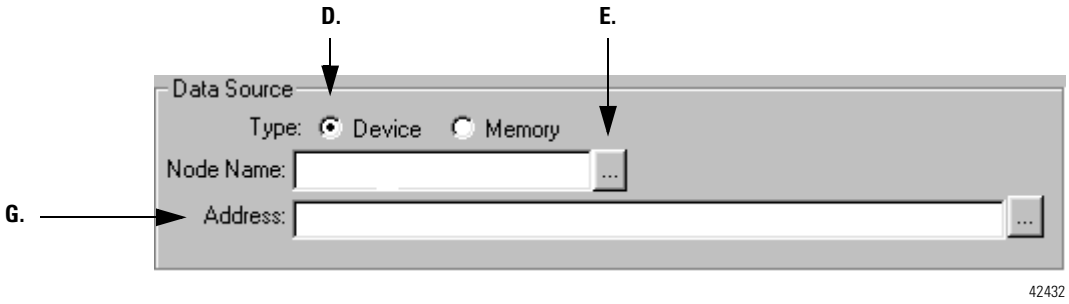


A. Double-click *Tag Database*.

B. Click *New*.



C. Specify the properties of the tag.



D. Click *Device*.

E. Click ....

F. Select the name of the node that you created in "Create an Unsolicited Node" and click *OK*.

G. Type the address for the tag:

If the controller:	Then type the:
writes the value	destination address that you specified in the MSG instruction
reads the value	source address that you specified in the MSG instruction

H. Click *Accept*.

Validate an RSView32 Tag

This procedure applies only to RSView32 projects.

A. On the *Edit Mode* tab, double-click *Tag Monitor*.

Tag Name	Value	State

B. Type the name of the RSView tag and press the *Enter* key.

Tag Name	Value	State
tag_name		

C. What does the *State* column display?

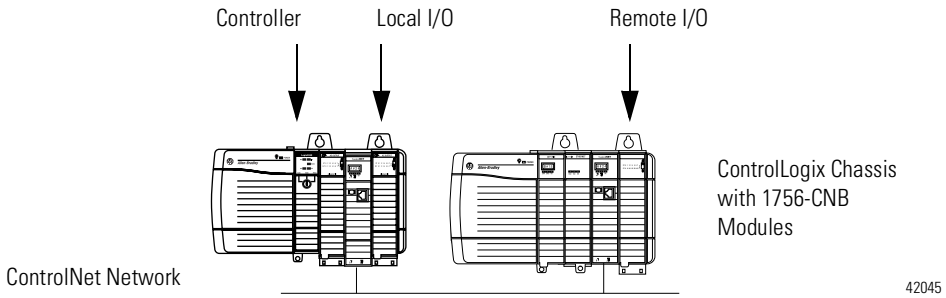
If:	Then:
valid	The tag contains a valid value from the controller.
error	There is a communication problem, such as the: • controller is not available • server is not running If a MSG instruction reads or writes the value, you will see *error* until the controller sends the message for the first time.

Communicate with 1756 I/O over a ControlNet™ Network

When to Use This Procedure

Use this procedure to monitor and control devices that are wired to 1756 I/O modules:

- local modules
- remote modules where 1756-CNB modules connect the local and remote chassis over a ControlNet network.



How to Use This Procedure

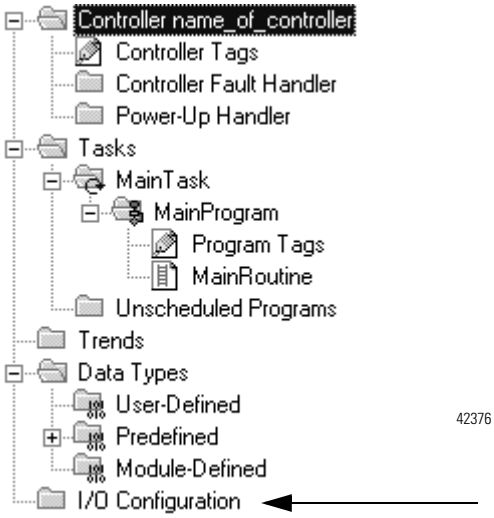
To complete this procedure, do the following steps:

IMPORTANT If the all the I/O modules are in the same chassis as the controller (no remote I/O), go to Add I/O Modules on page 8-6.

- Add the Local 1756-CNB Module
- Add the Remote 1756-CNB Module
- Add I/O Modules
- Create Aliases
- Schedule the ControlNet Network
- Validate Connections

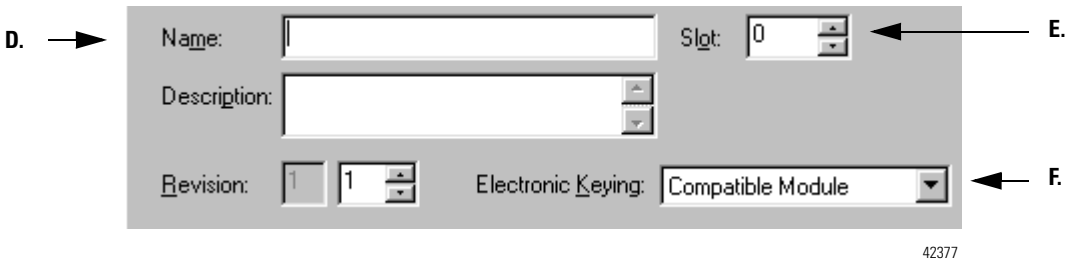
Add the Local 1756-CNB Module

A. Open the RSLogix 5000™ project offline.



B. Right-click *I/O Configuration* and select *New Module*.

C. Select your type of CNB and click *OK*.



D. Type a name for the module (i.e., `name_of_local_cnb`).

E. Type or select the slot number where the module is installed

F. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.

H. Initially, do you want to the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE

Inhibit a module

Use the Inhibit Module check box to make it easier to test a system:

- Initially, inhibit the module.
- When you are ready to test the devices that are associated with the module, clear the check box.

I. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

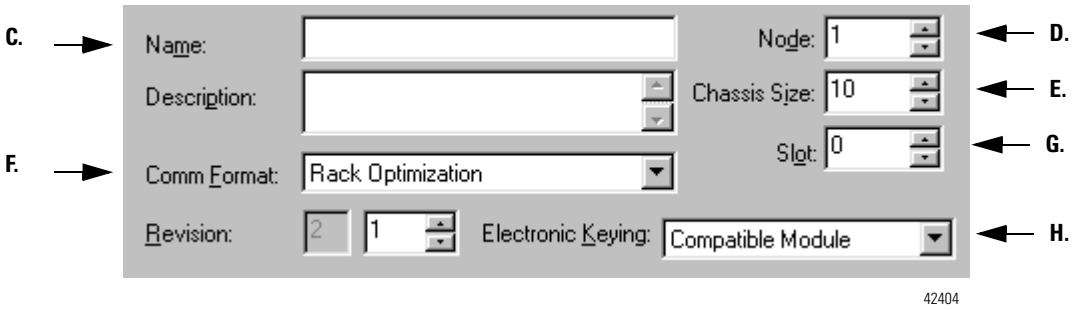
If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

J. Click *Finish*.

Add the Remote 1756-CNB Module

A. Right-click *name_of_local_cnb* and select *New Module*.

B. Select the type of CNB that is in the remote chassis and click *OK*.



C. Type a name for the CNB module. Use a name that identifies the I/O in the chassis.

D. Type or select the ControlNet node number of the module.

E. Type or select the number of slots in the remote chassis.

F. Are most of the modules in the chassis non-diagnostic, digital I/O modules?

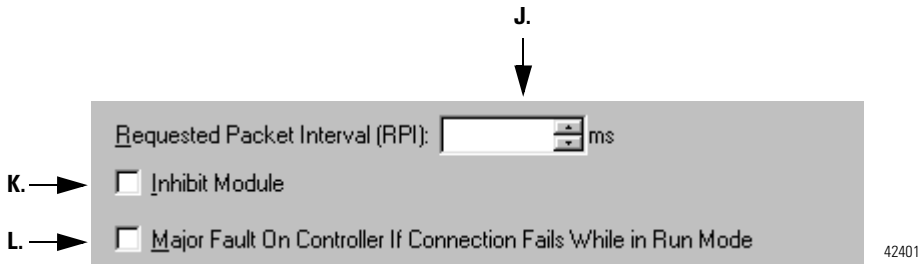
If:	Then select
Yes	*Rack Optimization*
No	*None*

G. Type or select the slot number where the module is installed

H. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

I. Click *Next*.



J. In step F., which Comm Format did you select?

If:	Then:
Rack Optimization	Type the rate at which the fastest device in the chassis must update. • Use a power of two times the ControlNet NUT. • For example, if the NUT is 5 ms, type a rate of 5, 10, 20 ms, etc.
None	No RPI is required. Go to the next step.

K. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

L. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

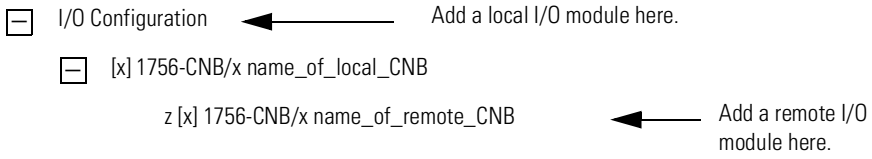
M. Click *Finish*.

Add I/O Modules

In this task, you add I/O modules to the I/O configuration of the controller.

A. Is the module in the I/O configuration of another controller?

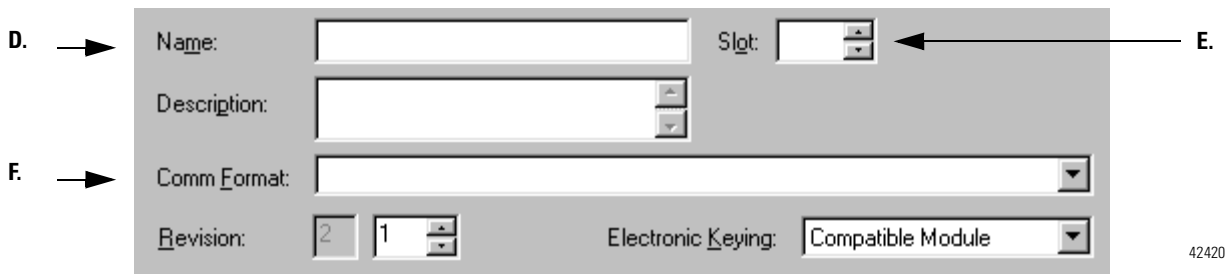
If:	And it is an:	And you want to:	Then:
no	→	→	Go to the next step.
yes	output module	→	Go to the next step.
	input module	maintain communication with the module if it loses communication with the other controller	1. Copy the module from the I/O configuration of the other controller. 2. Paste the module into the I/O configuration of this controller. 3. Go to Create Aliases
		stop communication with the module if it loses communication with the other controller	Go to the next step.


I/O Configuration
Add a local I/O module here.
[x] 1756-CNB/x name_of_local_CNB
z [x] 1756-CNB/x name_of_remote_CNB
Add a remote I/O module here.

B. Where is the module located?

If it is in:	Then:
same chassis as controller	right-click *I/O Configuration* and select *New Module*.
remote chassis	right-click the remote 1756-CNB module and select *New Module*.

C. Select the type of module and click *OK*.



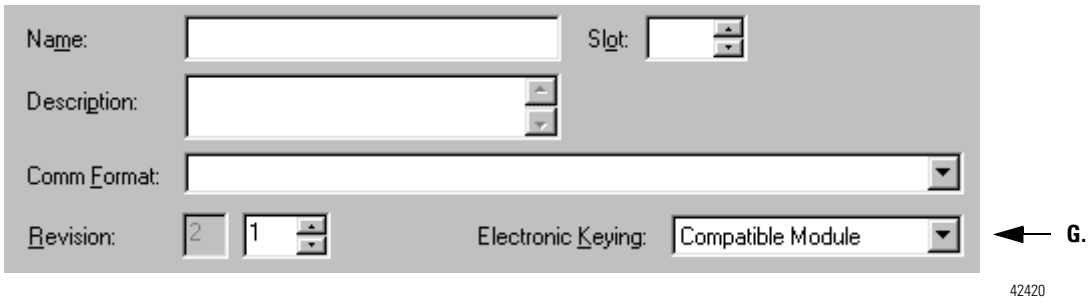
D. Type a name for the module.

E. Type or select the slot number where the module is installed.

F. Select a *Comm Format*:

IMPORTANT If the module is also in the I/O configuration of another controller, then select the *Listen Only* version of the Comm Format (e.g., *Listen Only - Input Data*).

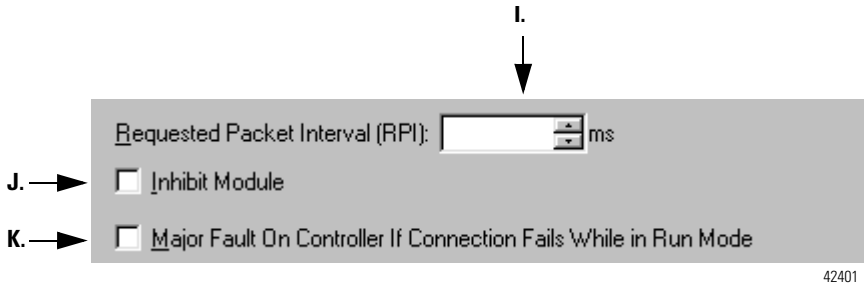
If this module is a:	And:	And you want to:	Then select:
diagnostic digital input	→	→	*Full Diagnostics - Input Data*
non-diagnostic digital input	local chassis	time stamp a change in data	*CST Timestamped Input Data*
		omit time stamps	*Input Data*
	remote chassis	→	*Rack Optimization*
diagnostic digital output	→	schedule when to apply outputs	*Full Diagnostics - Scheduled Output Data*
	→	not schedule when to apply outputs	*Full Diagnostics - Output Data*
fused digital output	→	schedule when to apply outputs	*CST Timestamped Fuse Data - Scheduled Output Data*
	→	not schedule when to apply outputs	*CST Timestamped Fuse Data - Output Data*
non-diagnostic and non-fused digital output	local chassis	schedule when to apply outputs	*Scheduled Output Data*
		not schedule when to apply outputs	*Output Data*
	remote chassis	→	*Rack Optimization*
non-isolated analog input	floating point mode provides sufficient sample time	time stamp when the data is sampled	*CST Timestamped Float Data -* `wiring_mode`
		omit the time stamp	*Float Data -* `wiring_mode`
	floating point mode *does not* provide sufficient sample time	time stamp when the data is sampled	*CST Timestamped Integer Data -* `wiring_mode`
		omit the time stamp	*Integer Data -* `wiring_mode`
isolated or temperature measuring analog input	25 ms sample time or greater is sufficient	time stamp when the data is sampled	*CST Timestamped Float Data*
		omit the time stamp	*Float Data*
	sample time must be less than 25 ms	time stamp when the data is sampled	*CST Timestamped Integer Data*
		omit the time stamp	*Integer Data*
analog output	associated inputs are REALs	time stamp the data echo	*CST Timestamped Float Data*
		omit the time stamp	*Float Data*
	associated inputs are INTs	time stamp the data echo	*CST Timestamped Integer Data*
		omit the time stamp	*Integer Data*



G. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

H. Click *Next*.



I. In step F., did you select *Rack Optimization* as the Comm Format?

If:	Then:
No	Type the rate at which the fastest device that is wired to the module must update. • Use a power of two times the ControlNet NUT. • For example, if the NUT is 5 ms, type a rate of 5, 10, 20 ms, etc.
Yes	No RPI is required. Go to the next step.

J. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

K. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

L. Click *Finish*.

Create Aliases

In this task, you convert tags in your programs to aliases for I/O points or channels (devices). As an alias for an I/O point or channel, each tag:

- provides a descriptive name for the device that is wired to the point or channel
- represents the value of the point or channel. When one changes, the other reflects the change.

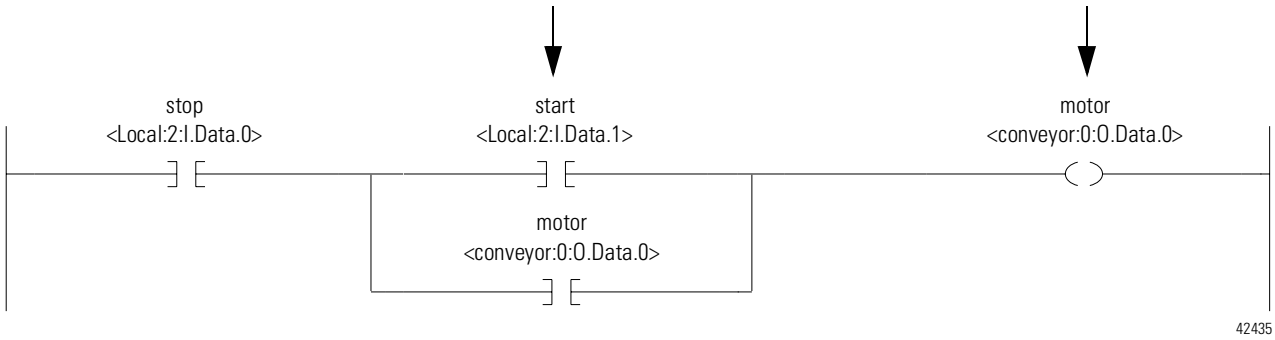
EXAMPLE

Create aliases

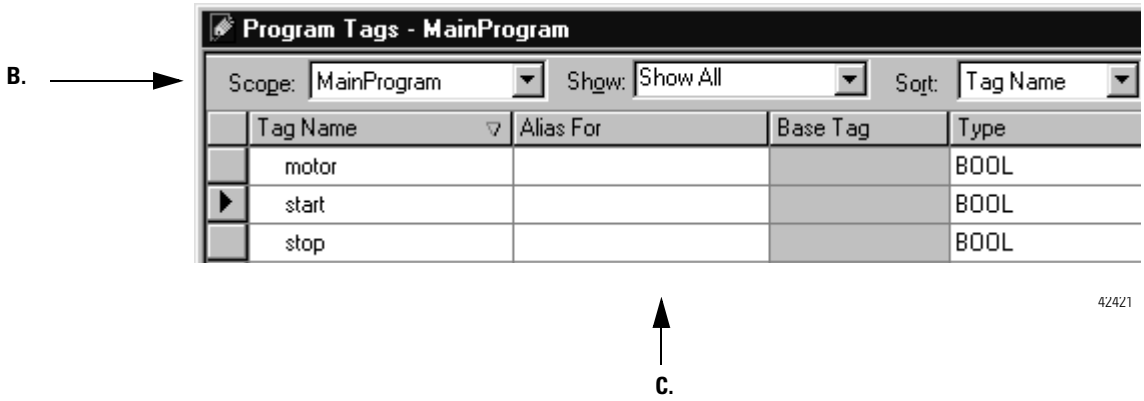
The following logic was initially programmed using descriptive tag names, such as *start* and *motor*. Later, the tags were converted to aliases for the corresponding I/O devices.

start is an alias for the push button that is wired to point 1 of the module that is in slot 2 of the local chassis. When the push button is on, *start* is on.

motor is an alias for the starter contactor that is wired to point 0 of the module that is in slot 0 of a remote chassis (named conveyor). When *motor* turns on, the starter contactor turns on.



A. From the *Logic* menu, select *Edit Tags*.



B. Select the scope of the descriptive tag.

C. To the right of the tag name, click the *Alias For* cell.

The cell displays a ▼

D. Click the ▼

E. Click the *Controller Scoped Tags* button, if it is available. (All the data for I/O modules is at the controller scope.)

F. Select the I/O device that the tag represents:

If the device is:	Then:
digital	1. Next to *name:slot:X,* click the + sign. 2. Click the *Data* member. 3. To the right of the *Data* member, click ▼ 4. Click the point number of the device.
analog	1. Next to *name:slot:X,* click the + sign. 2. Scroll down and double-click *ChzData*.

Where:	Is:	
name	name of the chassis:	
	If:	Then the name is:
	local	Local
	remote	name of the communication module in the chassis, such as a 1756-ENBx or 1756-CNB module.
slot	slot number of the module	
X	type of device:	
	If:	Then:
	input	*I*
	output	*O*
Chz	channel that the device is wired to	

G. Press the *Enter* key or click another cell.

When you finish, the Tags window should look similar to the following:

Tag Name	Alias For	Base Tag
start	conveyor:1:I.Data.1(C)	conveyor:1:I.Data.1(C)

start is an alias for point 1 of the input module that is in slot 1 of a remote chassis (named conveyor).

TIP

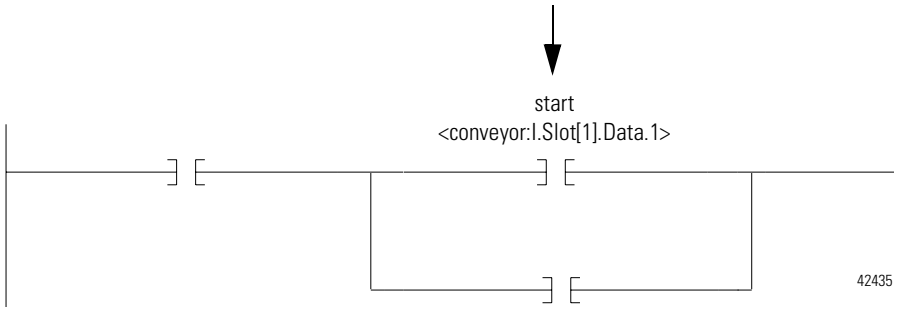
Even if the I/O module uses the Rack Optimization Comm Format, address the required point as described in step F.

Tag Name	Alias For	Base Tag
start	conveyor:1:I.Data.1(C)	conveyor:I.Slot[1].Data.1(C)

start is an alias for point 1 of the input module that is in slot 1 of a remote chassis (named conveyor).

Because the module uses the Rack Optimization format, a structure associated with the communication module in the remote chassis actually transfers the data.

However, the ladder logic displays the address of the data within the structure for the communication module (e.g., ENB, CNB):



Schedule the ControlNet Network

A. Download the RSLogix 5000 project to the controller.

B. Start RSNetworx™ for ControlNet software.

C. Has this network been scheduled before?

If: No

Then:

1. From the *File* menu, select *New*.
2. From the *Network* menu, select *Online*.
3. Select your ControlNet network and choose *OK*.
4. Select the *Edits Enabled* check box.
5. From the *Network* menu, select *Properties*.
6. From the *Network Parameters* tab, type or select the following parameters:

In this box:	Specify:
Network Update Time	repetitive time interval in which data is sent over the ControlNet network
Max Scheduled Address	greatest node number to use scheduled communications on the network
Max Unscheduled Address	greatest node number that you will use on the network
Media Redundancy	channels in use
Network Name	name for the network

7. Click *OK*.
8. From the *Network* menu, select *Single Pass Browse*.
9. From the *File* menu, select *Save*.
10. Type a name for the file that stores the network configuration, then click *Save*.
11. Select the *Optimize and re-write Schedule for all Connections* button (default) and click *OK*.
12. In RSLogix 5000 software, save the online project.

If: Yes

Then:

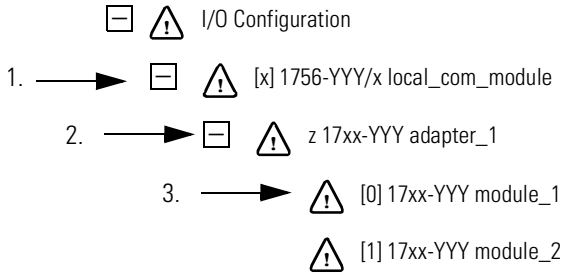
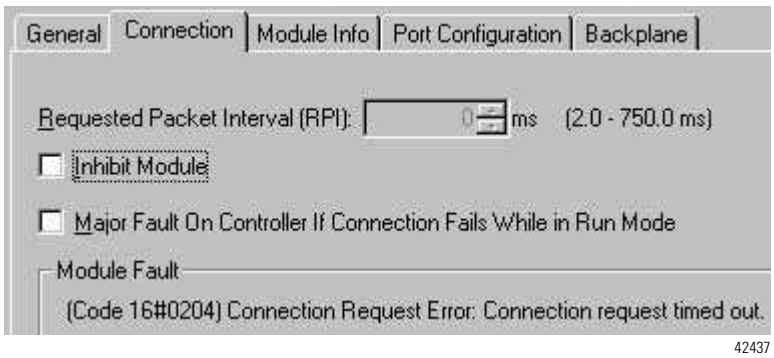
1. From the *File* menu, select *Open*.
2. Select the file for the network and choose *Open*.
3. From the *Network* menu, select *Online*.
4. Select the *Edits Enabled* check box.
5. From the *Network* menu, select *Properties*.
6. From the *Network Parameters* tab, update the following parameters:

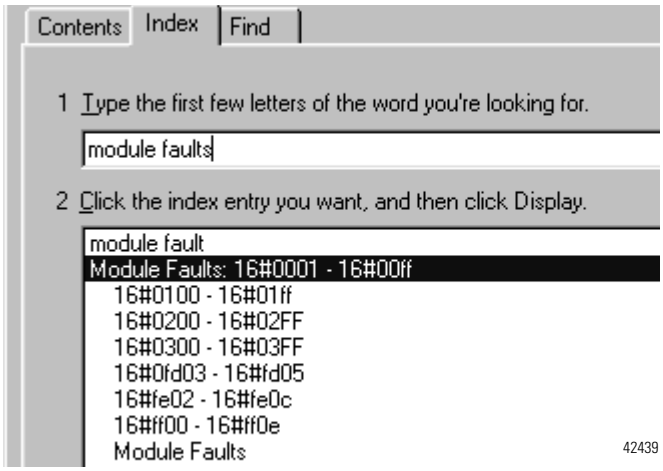
In this box:	Specify:
Max Scheduled Address	greatest node number to use scheduled communications on the network
Max Unscheduled Address	greatest node number that you will use on the network

7. Click *OK*.
8. From the *Network* menu, select *Single Pass Browse*.
9. From the *File* menu, select *Save*.
10. Select the *Optimize and re-write Schedule for all Connections* button (default) and click *OK*.
11. In RSLogix 5000 software, save the online project.

Validate Connections

Is this task, you verify that the controller can communicate with the devices that you have just configured.

Step:	Detailed actions:	
A. Determine if communications are established.	Is a ⚠ over the I/O Configuration folder?	
	If:	**Then:**
	No	The controller can communicate with the module.
	Yes	Communications are not established. Go to the next step.
B. Identify a fault. Start at the local communication module and work down through the tree.		
C. Identify the fault code.	1. Right-click the module and select *Properties*. 2. Click the *Connection* tab.  3. Identify the code for the fault.	

Step:	Detailed actions:
D. Clear the fault.	1. From the *Help* menu, select *Contents*. 2. Click the *Index* tab. 3. Type *module faults*. **4.** →  4. Select the range for the code and click *Display*. 5. Scroll down to your fault code and follow the recommendations.
E. Go to step A.	

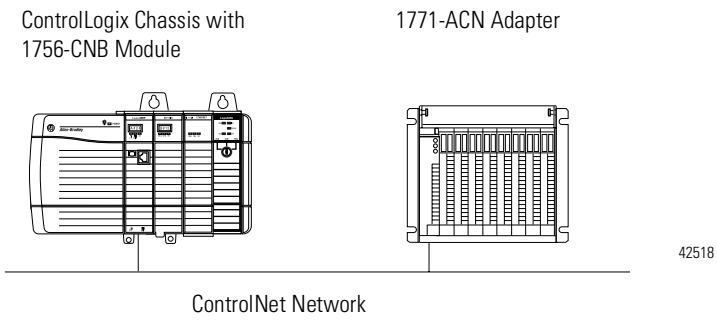
Notes:

Communicate with 1771 I/O Over a ControlNet™ Network

When to Use This Procedure

Use this procedure to monitor and control I/O devices that are wired to 1771 I/O modules when a:

- 1756-CNB module connects the local chassis to a ControlNet network.
- 1771-ACN adapter connects the 1771 I/O modules to the same ControlNet network.

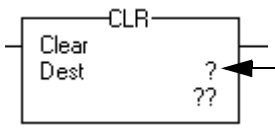


How to Use This Procedure

TIP

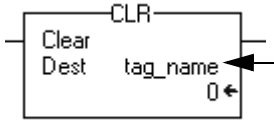
To create and manage tags as you program your logic, use these tips:

- To create a tag:



1. Type the name for the tag.
2. Right-click the tag and choose *New "tag_name"*.

- To change the name of a tag:



Right-click the tag and choose *Edit "tag_name" Properties*.

If you have not already done so in a previous procedure, do the following preliminary task:

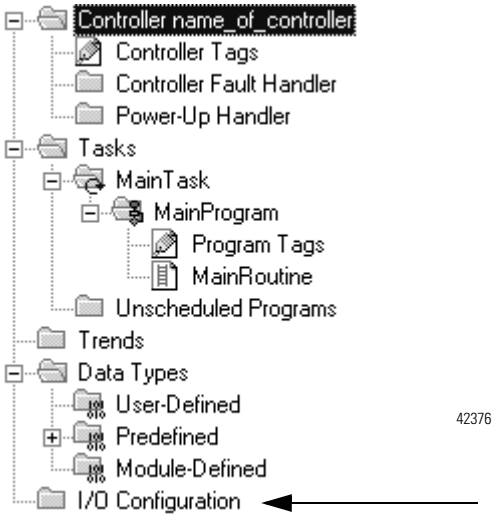
- Add the Local 1756-CNB Module

To complete this procedure, do the following tasks:

- Add the 1771-ACN Module
- Communicate with Block Transfer Modules, using either of these procedures:
  - Read or Write Data To or From a Block Transfer Module
  - Read or Write Data To or From Multiple Block Transfer Modules
- Address I/O
- Schedule the ControlNet Network
- Validate Connections
- Stagger the Messages

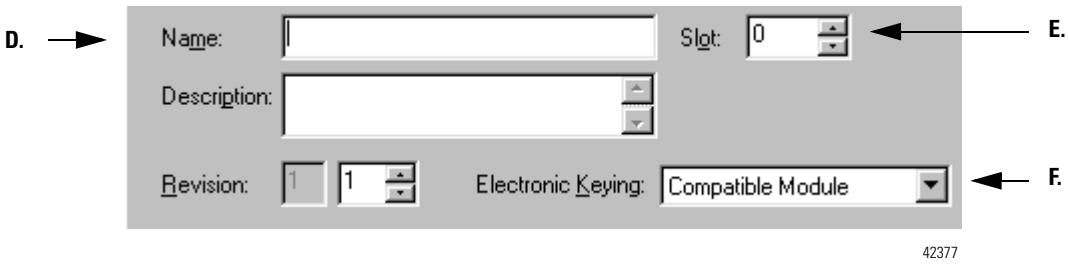
Add the Local 1756-CNB Module

A. Open the RSLogix 5000™ project offline.



B. Right-click *I/O Configuration* and select *New Module*.

C. Select your type of CNB and click *OK*.



D. Type a name for the module (i.e., `name_of_local_cnb`).

E. Type or select the slot number where the module is installed

F. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.

H. Initially, do you want to the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE

Inhibit a module

Use the Inhibit Module check box to make it easier to test a system:

- Initially, inhibit the module.
- When you are ready to test the devices that are associated with the module, clear the check box.

I. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

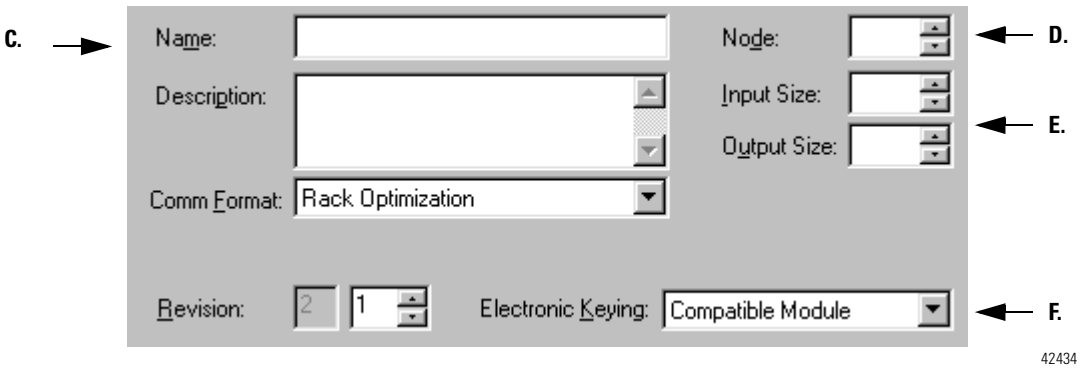
If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

J. Click *Finish*.

Add the 1771-ACN Module

A. Right-click *name_of_local_cnb* and select *New Module*.

B. Select the type of 1771-ACN that is in the remote chassis and click *OK*.



C. Type a name for the module. Use a name that identifies the I/O in the chassis.

D. Type or select the ControlNet node number of the module.

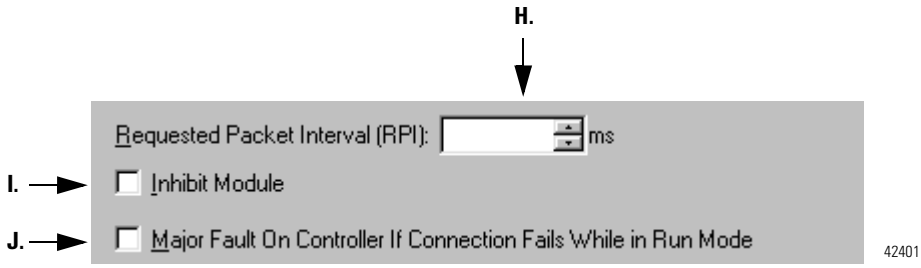
E. Specify the *Input Size* and *Output Size*:.

If the chassis uses:	Then type or select:	Example:
2-slot addressing	number of slots in the chassis / 2	For a 4-slot chassis, specify 2 for the input and output sizes.
1-slot addressing	number of slots in the chassis	For a 4-slot chassis, specify 4 for the input and output sizes.
1/2-slot addressing	number of slots in the chassis x 2	For a 4-slot chassis, specify 8 for the input and output sizes.

F. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.



H. Type the rate at which the fastest device in the chassis must update.

- Use a power of two times the ControlNet NUT.
- For example, if the NUT is 5 ms, type a rate of 5, 10, 20 ms, etc.

I. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

J. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

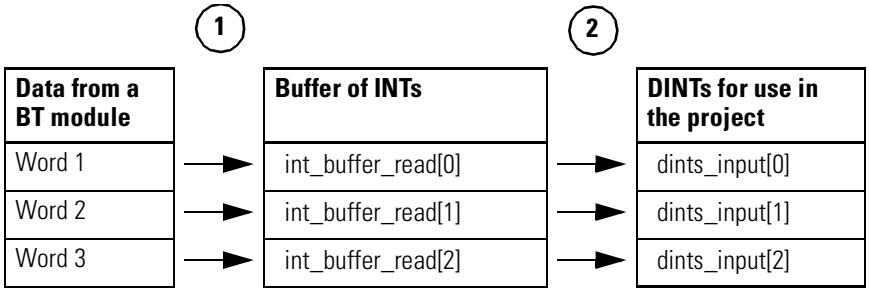
If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

K. Click *Finish*.

Read or Write Data To or From a Block Transfer Module

Use this procedure to transfer data to or from a module that requires block transfers.

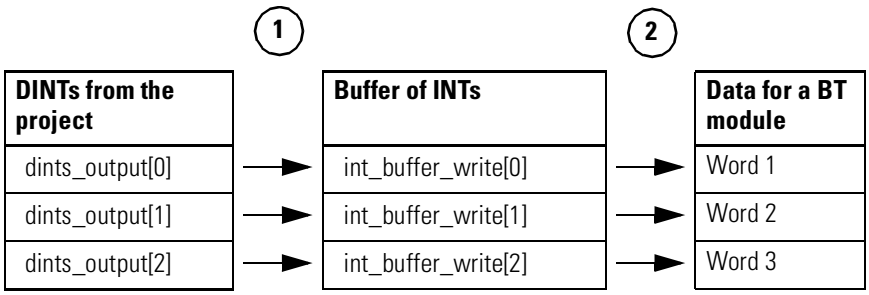
Block Transfer Read



1. The MSG instruction reads 16-bit integers (INTs) from the BT module and stores them in a temporary array of INTs.

2. An FAL instruction converts the INTs to 32-bit integers (DINTs). Logix5000 controllers execute more efficiently and use less memory when working with DINTs.

Block Transfer Write



1. An FAL instruction converts the 32-bit integers (DINTs) from the Logix5000 controller to 16-bit integers (INTs):

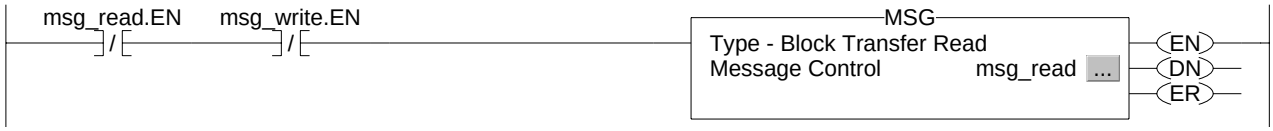
   - Logix5000 controllers execute more efficiently and use less memory when working with DINTs.
   - The instruction stores the data in a temporary array of INTs.

2. The MSG instruction writes the INTs from the temporary array to BT module.

Read Data From a Block Transfer Module

1. Enter the following rung:

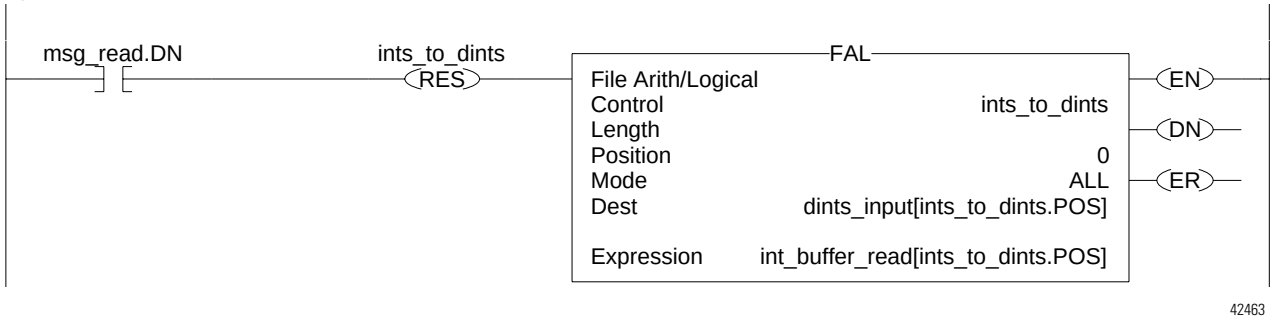
Reads 16-bit integers (INTs) from the module and stores them in *int_buffer_read*. (Only include the *msg_write.EN* tag and associated instruction if you also send a block transfer write message to the same module.)



Tag Name:	Description:	Data Type:	Scope:
msg_read	block transfer read message	MESSAGE	*name_of_controller* (controller)
msg_write	block transfer write message to the same module	MESSAGE	*name_of_controller* (controller)

2. Enter the following rung:

When *msg_read* is done, the FAL instruction moves the values in *int_buffer_read* to *dints_input*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the controller.



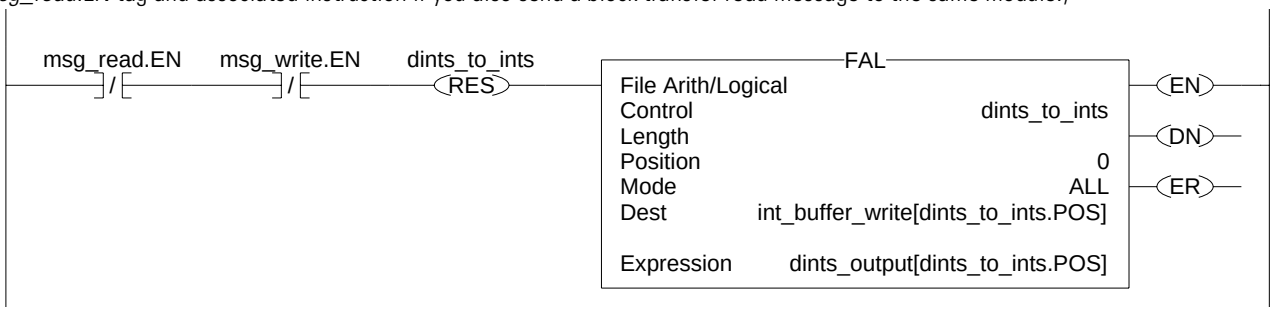
Tag Name:	Description:	Data Type:	Scope:
int_buffer_read	array that stores the data from the BT module	INT [*length*]	*name_of_controller* (controller)
ints_to_dints	converts the 16-bit integers from the BT module to 32-bit integers for the Logix5000 controller	CONTROL	*name_of_controller* (controller)
FAL Length	number of elements to convert	immediate value equal to *length*	
dint_inputs	array that stores the input data from the module for use by the controller	DINT [*length*]	*name_of_controller* (controller)

Where:	Is the:
length	number of elements to transfer

Write Configuration or Output Data To a Block Transfer Module

1. Enter the following rung:

The application writes configuration and output data to *dints_output*, which is an array of DINTs. Before the controller sends the data to the module, the FAL instruction moves the values to *int_buffer_write*. This converts them to 16-bit integers (INTs). (Only include the *msg_read.EN* tag and associated instruction if you also send a block transfer read message to the same module.)

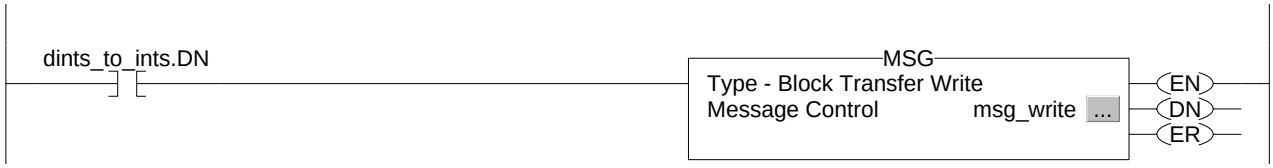


Tag Name:	Description:	Data Type:	Scope:
msg_read	block transfer read message to the same module	MESSAGE	*name_of_controller* (controller)
msg_write	block transfer write message	MESSAGE	*name_of_controller* (controller)
dints_to_ints	converts the 32-bit integers from the Logix5000 controller to 16-bit integers for the BT module	CONTROL	*name_of_controller* (controller)
FAL Length	number of elements to convert	immediate value equal to *length*	
int_buffer_write	array that stores the data to send to the BT module as 16-bit integers	INT [*length*]	*name_of_controller* (controller)
dints_output	array that stores the output data that other instructions produce for the module	DINT [*length*]	*name_of_controller* (controller)

Where:	Is the:
length	number of elements to transfer

2. Enter the following rung:

After the FAL instruction converts the DINTs to INTs, the MSG instruction sends the data in *int_buffer_write* to the module.



Configure the Messages

1. In the MSG instruction, click ... .

2. Select a configuration:

If you want to:	For this item:	Type or select:
read input data	Message Type	*Block Transfer Read*
	Number Of Elements	number of INTs to read
	Destination Tag	*int_buffer_read [0]*
write configuration or output data	Message Type	*Block Transfer Write*
	Source Tag	*int_buffer_write [0]*
	Number Of Elements	number of INTs to write

3. Click the *Communication* tab.

For this item:	Type or select:
Path	Path to the 1771-ACN module: A. Click *Browse…* B. Select the 1771-ACN module that is in the chassis with the block transfer module. C. Choose *OK*. Although your logic will control the path, the Message Properties dialog box requires an initial selection.
RIO or ControlNet	ControlNet
Slot	slot number of the BT module Although your logic will control this value, the Message Properties dialog box requires an initial value (0 - 15).

4. How many devices require block transfer instructions?

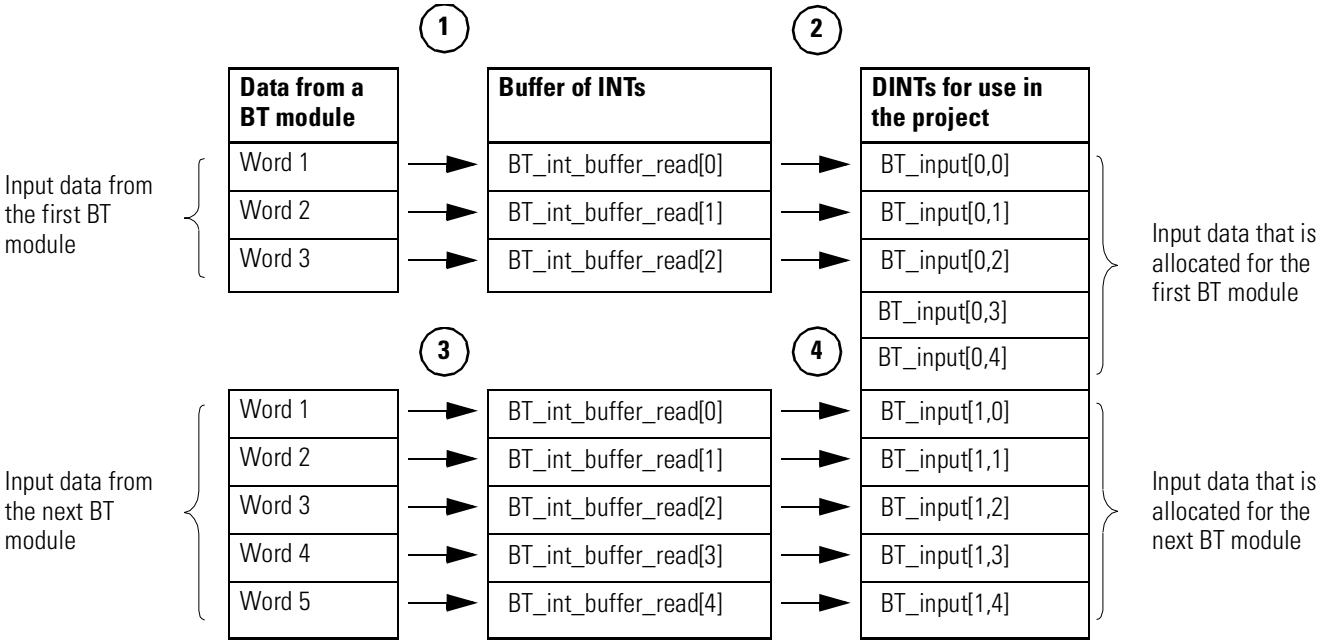
If:	Then:
16 or less devices	Leave the *Cache Connection* check box selected (checked).
more than 16 devices	A. Select 16 devices that require the most frequent updates. B. Is this message to one of those devices? **If:** / **Then** Yes — Leave the *Cache Connection* check box selected (checked). No — Clear the *Cache Connection* check box.

5. Choose *OK*.

Read or Write Data To or From Multiple Block Transfer Modules

Use this procedure to program a single MSG instruction to read data from multiple block transfer modules.

The following diagram shows the flow of data for a block transfer read. The block transfer write sequence works in the opposite order.



1. The MSG instruction reads 16-bit integers (INTs) from the first BT module and stores them in a temporary array of INTs.

2. An FAL instruction converts the INTs to 32-bit integers (DINTs). Logix5000 controllers execute more efficiently and use less memory when working with DINTs.

3. The MSG instruction reads the next module. This procedures lets you vary the number of INTs that you read from each module.

4. The FAL instruction moves the data to the next element of dimension 0 of the DINT array. Each element of this dimension corresponds to a different BT module.

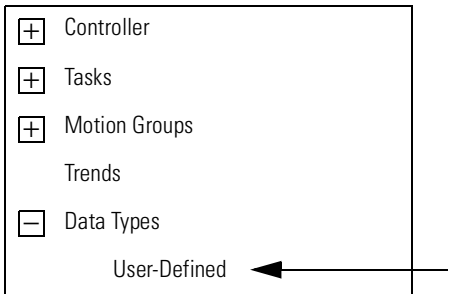
To read multiple block transfer modules:

- Create a User-Defined Data Type
- Create the Array for the Input Data
- Send a Block Transfer Read Message
- Enter the BTR Properties for Each Module
- Convert the INTs to DINTs
- Step to the Next BT Module

To write data to multiple block transfer modules, see the logic on page 9-20.

Create a User-Defined Data Type

Create the following data type. You will use this for the array that stores the message properties for each module.



1. Right-click and select *New Data Type*.
2. Assign the following:

Name	BT_CONFIGURATION			
Description	Configuration properties for a block transfer message to a specific module			
Members				
	Name	**Data Type**	**Style**	**Description**
	REQ_LEN	INT	Decimal	number of elements (INTs) to read or write
	Slot	SINT	Decimal	slot number of the module
	⊞ Path	STRING		path to the 1771-ACN module (Use the Message Path editor to assign the path.)

Create the Array for the Input Data

Enter the following rung:

The SIZE instruction determines the number of elements in the first dimension (Dim 0) of the *BT_input* array. Since this dimension contains one element for each BT module, this instruction determines how many modules the MSG instruction must read. A subsequent rung uses this number to determine the end of the sequence of MSGs.

Tag Name:	Description:	Data Type:	Scope:
BT_input	data from each BT module • The first dimension represents each module. • The second dimension represents the data from a module.	DINT [*number*, *length*]	*name_of_controller* (controller)
BT_input_modules	number of modules that the MSG instruction must read	DINT	*name_of_controller* (controller)

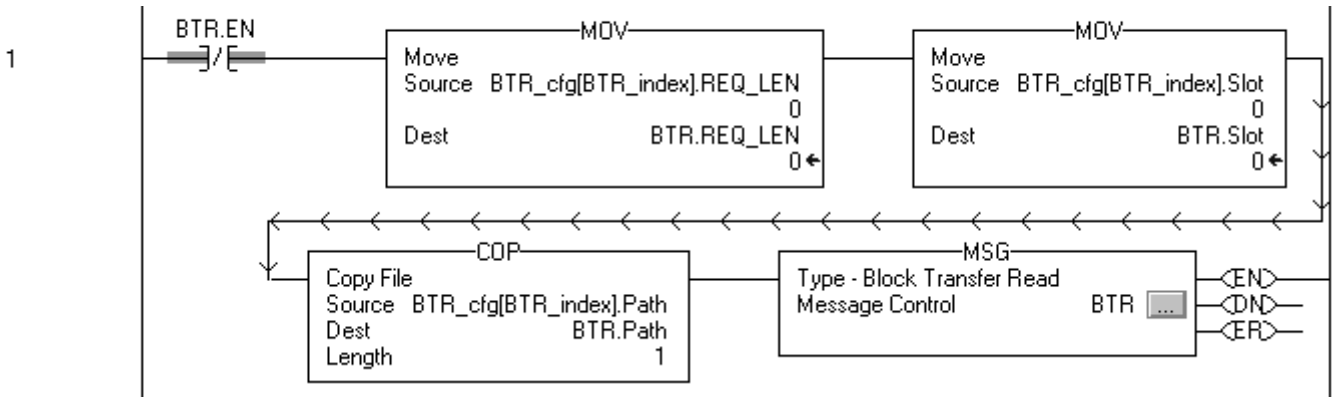
Where:	Is the:
number	number of modules that this message reads
length	maximum number of elements in any of the block transfers

Send a Block Transfer Read Message

1. Enter the following rung:

The MSG instruction reads the input values from a BT module and stores the values in *BTR_int_buffer_read*.

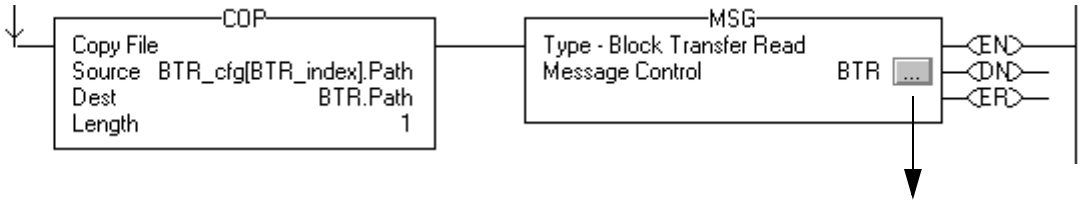
- Each time the instruction is done, it automatically restarts and sends another message.
- Prior to each message, the series of MOV and COPY instructions load the appropriate configuration properties into the MSG instruction so it can read the next BT module. The configuration properties load from the *BTR_cfg* array.
- After each MSG, a subsequent rung increments the *BTR_index* tag. This loads the configuration properties for the next module into the MSG instruction before it executes again.



Tag Name:	Description:	Data Type:	Scope:
BTR	block transfer message that reads data from each BT module	MESSAGE	*name_of_controller* (controller)
BTR_cfg	array of configuration properties for each BT module	BT_CONFIGURATION [*number*]	*name_of_controller* (controller)
BTR_index	controls which BT module that the MSG instruction reads	DINT	*name_of_controller* (controller)

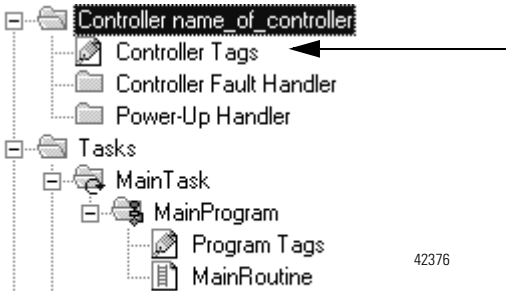
Where:	Is the:
number	number of modules that this message reads

2. Configure the message:



On this tab:	For this item:	Type or select:
Configuration	Message Type	*Block Transfer Read*
	Number Of Elements	1 Although your logic will control this value, the Message Properties dialog box requires an initial value.
	Destination Tag	*BTR_int_buffer_read* To create this tag: A. Click *New Tag*. B. Type the name. C. In the Data type box, type INT[`length`], where `length` equals the `length` variable of the *BT_input* tag from page 9-14. D. Choose *OK*.
Communication	Path	Path to the 1771-ACN module: A. Click *Browse…* B. Select the 1771-ACN module with which you want to communicate. C. Choose *OK*. Although your logic will control the path the Message Properties dialog box requires an initial path.
	Slot	slot number of the BT module Although your logic will control this value, the Message Properties dialog box requires an initial value.
	Cache Connection check box	Clear the *Cache Connection* check box..

Enter the BTR Properties for Each Module



1. Double-click *Controller Tags*.
2. Enter the BTR properties for each BT module.

Tag Name	Value
⊟ BTR_cfg	(…)
⊟ BTR_cfg[0]	(…)
⊞ BTR_cfg[0].REQ_LEN	number of elements to transfer
⊞ BTR_cfg[0].Slot	slot number of the module (independent of chassis addressing)
⊞ BTR_cfg[0].Path	path to the 1771-ACN module: A. Right-click and select *Go to Message Path Editor.* B. Select the 1771-ACN module. C. Choose *OK*.
⊞ BTR_cfg [1]	

Properties for the first BT module

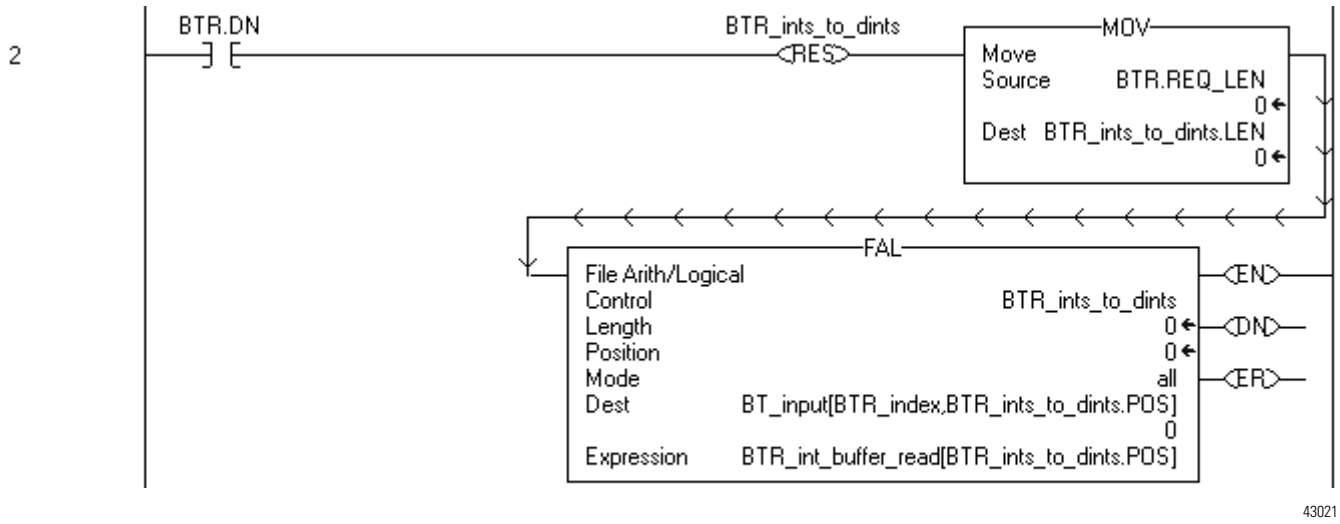
Properties for the next BT module

Convert the INTs to DINTs

Enter the following rung:

After the MSG instruction reads data from a module (*BTR.DN* is on), this rung converts the INT values from the BT module to DINT values for use in the project:

- The MOV instruction sets the length of the FAL instruction equal to the number of elements that the MSG reads.
- The FAL instruction then loads the values from *BTR_int_buffer_read* into *BT_input*. This converts the values to DINTs for use in the project.
- *BTR_index* determines where in the first dimension of *BT_input* to store the values. Each element of this dimension corresponds to a specific BT module.



Tag Name:	Description:	Data Type:	Scope:
BTR_ints_to_dints	converts the 16-bit integers from the BT module to 32-bit integers for the Logix5000 project	CONTROL	*name_of_controller* (controller)

Step to the Next BT Module

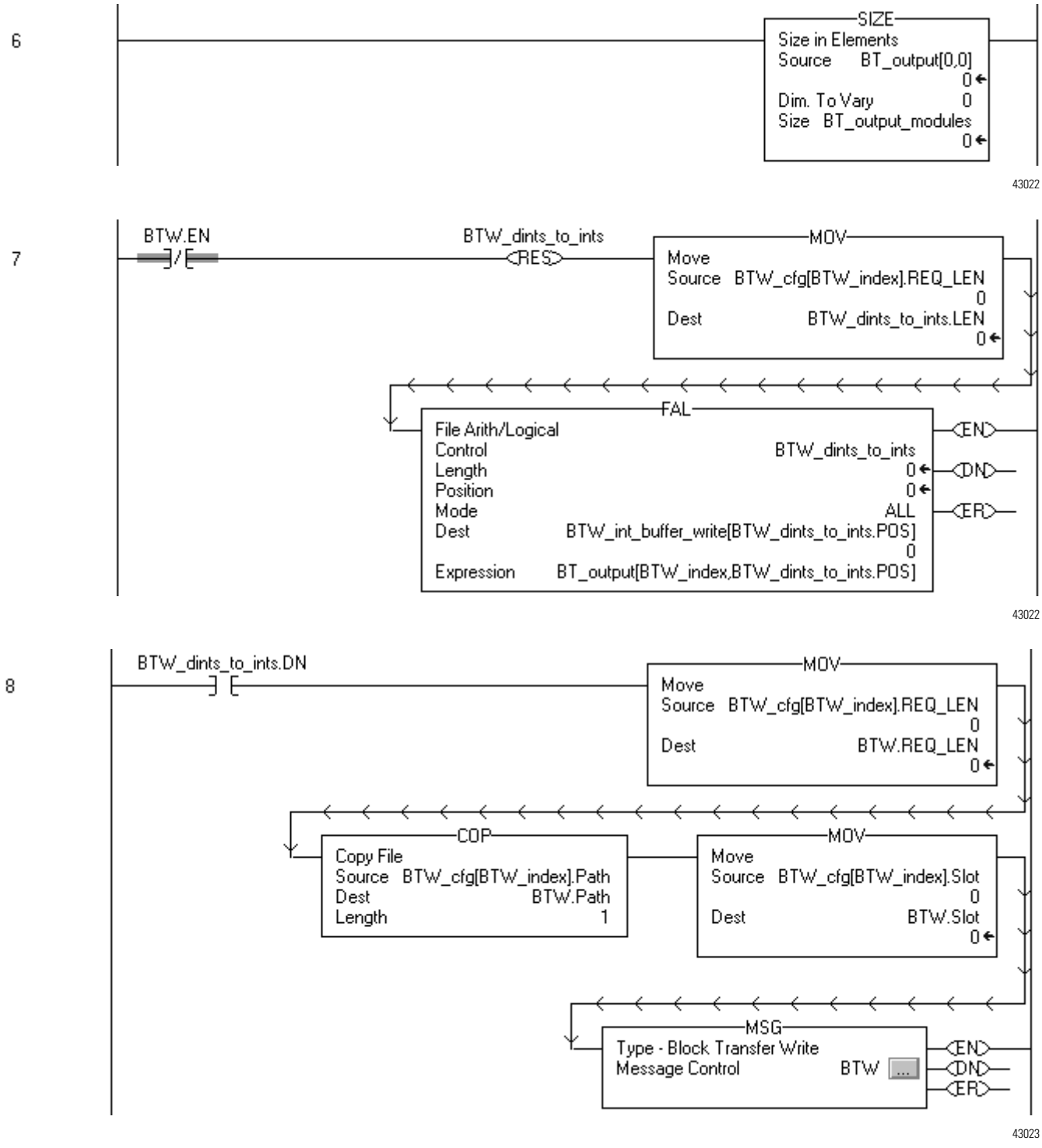
1. Enter the following rung:

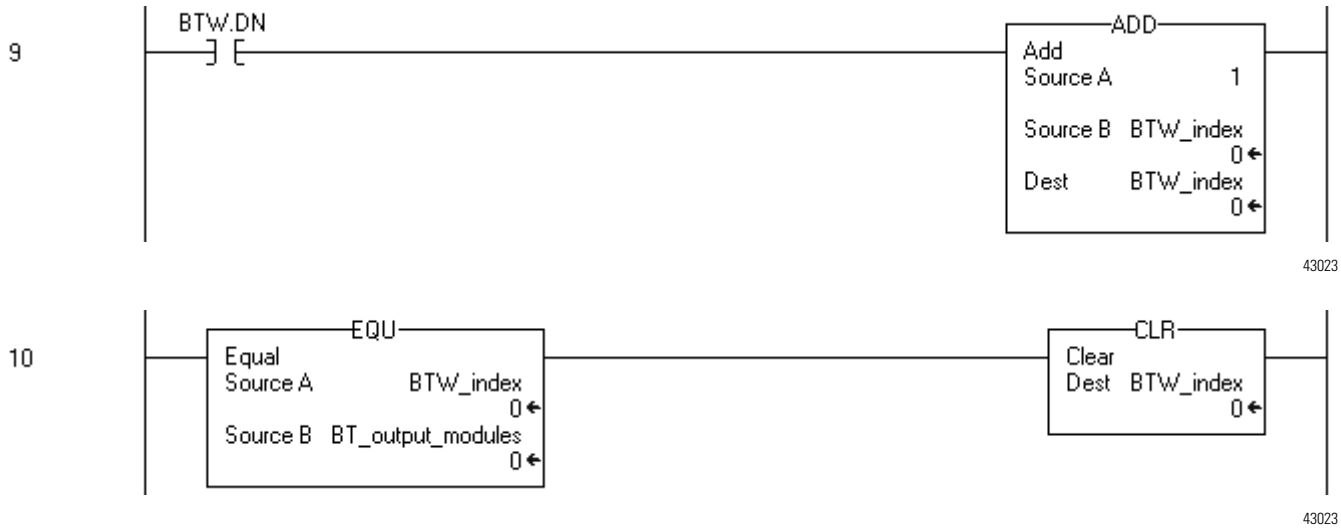
After the MSG instruction reads data from a module and the FAL converts it to DINTs (*BTR_ints_to_dints.DN* is on), the ADD instruction increments the *BTR_index*. This lets the MSG instruction read the next module.

2. Enter the following rung:

If the EQU instruction is true, the MSG instruction has read the last BT module. The CLR instruction resets *BTR_index* to zero. This lets the MSG instruction start the series of reads again, starting with the first module.

Write Data to Multiple Block Transfer Modules




9
BTW.DN
ADD
Add
Source A 1
Source B BTW_index
0
Dest BTW_index
0
43023
10
EQU
Equal
Source A BTW_index
0
Source B BT_output_modules
0
CLR
Clear
Dest BTW_index
0
43023

Address I/O

To monitor or control an I/O device, assign the tag name of the device to an instruction in your logic:

- For step-by-step instructions on how to enter logic and tag names, see the *Logix5000 Controllers Common Procedures*, publication 1756-PM001.
- All the data for I/O modules is at the controller scope. As you assign addresses, click the *Controller Scoped Tags* button to see the I/O tags.
- Use the following table to select the address of an I/O device:

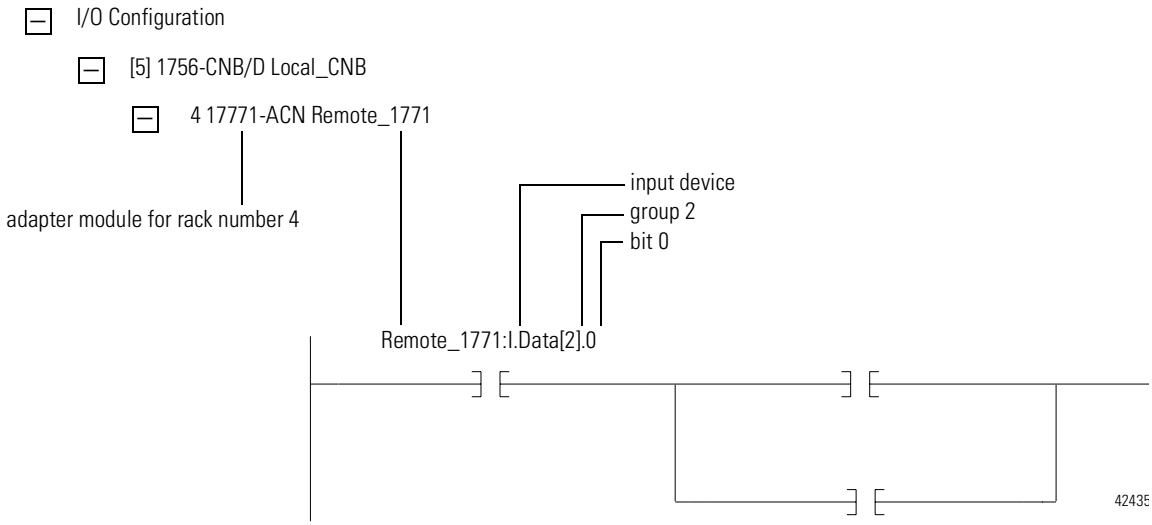
If the device is:	Then use this address:
digital	*name*:*type*.Data[*group*].*bit*
analog	element of the array that stores the data for or from this device

Where:	Is:
name	name of the remote I/O adapter, such as the 1771-ACN module • Use the name for the rack that contains the module to which this device is wired. • Use the name from the I/O configuration of the controller.
type	type of device:

If:	Then:
input	I
output	O

group	group number of the module to which this device is wired
bit	point (bit) number to which this device is wired

EXAMPLE Address a digital device that is wired to a 1771 I/O module



Schedule the ControlNet Network

A. Download the RSLogix 5000 project to the controller.

B. Start RSNetworx™ for ControlNet software.

C. Has this network been scheduled before?

If: No

Then:

1. From the *File* menu, select *New*.
2. From the *Network* menu, select *Online*.
3. Select your ControlNet network and choose *OK*.
4. Select the *Edits Enabled* check box.
5. From the *Network* menu, select *Properties*.
6. From the *Network Parameters* tab, type or select the following parameters:

In this box:	Specify:
Network Update Time	repetitive time interval in which data is sent over the ControlNet network
Max Scheduled Address	greatest node number to use scheduled communications on the network
Max Unscheduled Address	greatest node number that you will use on the network
Media Redundancy	channels in use
Network Name	name for the network

7. Click *OK*.
8. From the *Network* menu, select *Single Pass Browse*.
9. From the *File* menu, select *Save*.
10. Type a name for the file that stores the network configuration, then click *Save*.
11. Select the *Optimize and re-write Schedule for all Connections* button (default) and click *OK*.
12. In RSLogix 5000 software, save the online project.

If: Yes

Then:

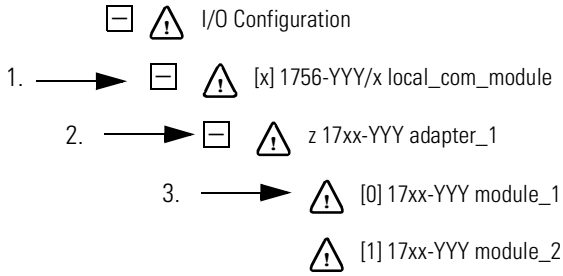
1. From the *File* menu, select *Open*.
2. Select the file for the network and choose *Open*.
3. From the *Network* menu, select *Online*.
4. Select the *Edits Enabled* check box.
5. From the *Network* menu, select *Properties*.
6. From the *Network Parameters* tab, update the following parameters:

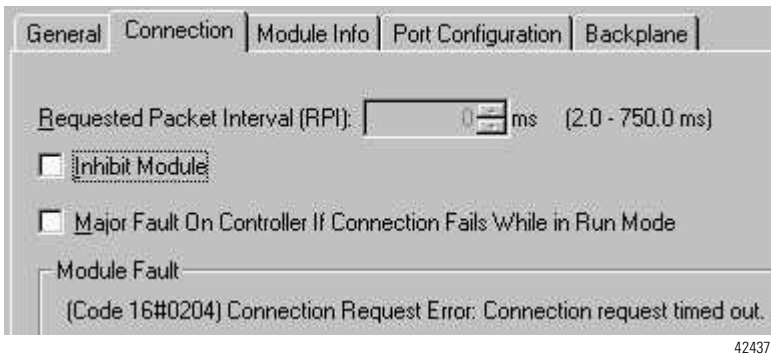
In this box:	Specify:
Max Scheduled Address	greatest node number to use scheduled communications on the network
Max Unscheduled Address	greatest node number that you will use on the network

7. Click *OK*.
8. From the *Network* menu, select *Single Pass Browse*.
9. From the *File* menu, select *Save*.
10. Select the *Optimize and re-write Schedule for all Connections* button (default) and click *OK*.
11. In RSLogix 5000 software, save the online project.

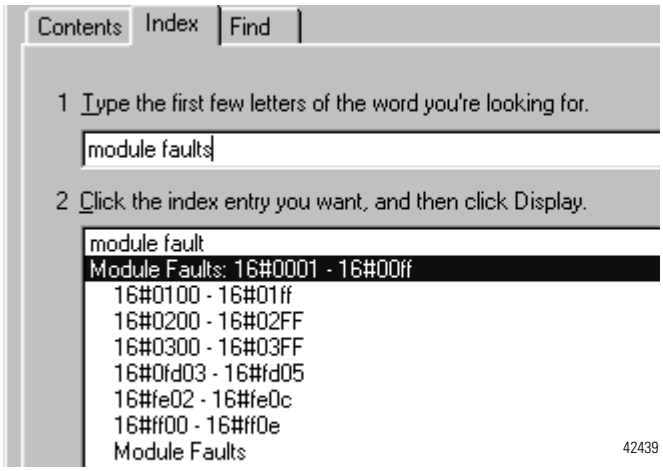
Validate Connections

Is this task, you verify that the controller can communicate with the devices that you have just configured.

Step:	Detailed actions:	
A. Determine if communications are established.	Is a ⚠ over the I/O Configuration folder?	
	If:	**Then:**
	No	The controller can communicate with the module.
	Yes	Communications are not established. Go to the next step.
B. Identify a fault. Start at the local communication module and work down through the tree.		
C. Identify the fault code.	1. Right-click the module and select *Properties*. 2. Click the *Connection* tab. 3. Identify the code for the fault.	



42437

Step:	Detailed actions:
D. Clear the fault.	1. From the *Help* menu, select *Contents*. 2. Click the *Index* tab. 3. Type *module faults*. **4.**  4. Select the range for the code and click *Display*. 5. Scroll down to your fault code and follow the recommendations.
E. Go to step A.	

Stagger the Messages

As you add messages to your project, you may have to coordinate the execution of the messages. To avoid errors and assure that each message is processed, follow these rules:

Rule 1:	Enable no more than 16 messages at one time (including block transfers).
Rule 2:	Enable no more than 10 of the following types of messages at one time: • CIP data table reads or writes that are *not* cached • CIP generic • PLC2, PLC3, PLC5, or SLC (all types) • block transfer reads or writes that are *not* cached

If the number of messages in your application exceeds rules 1 and 2, then stagger the execution of your messages. Here are some options:

- Send each message in sequence
- Send the messages in groups that are within the limits of rules 1 and 2
- Program a message to communicate with multiple devices. Refer to Read or Write Data To or From Multiple Block Transfer Modules on page 9-12.

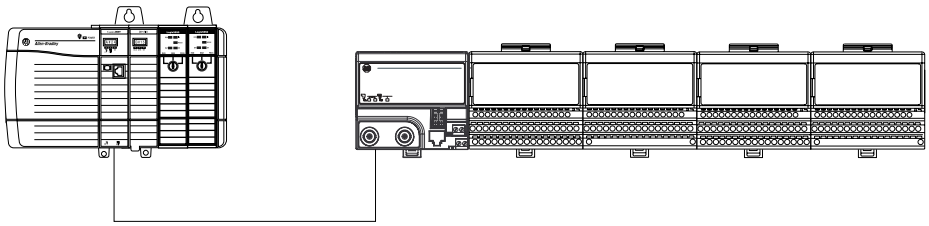
Notes:

Communicate with 1794 I/O Over a ControlNet™ Network

When to Use This Procedure

Use this procedure to monitor and control I/O devices that are wired to 1794 I/O modules when a:

- 1756-CNB module connects the local chassis to a ControlNet network.
- 1794-ACN adapter connects the 1794 I/O modules to the same ControlNet network.



How to Use This Procedure

If you have not already done so in a previous procedure, do the following preliminary step:

- Add the local 1756-CNB module

To complete this procedure, do the following steps:

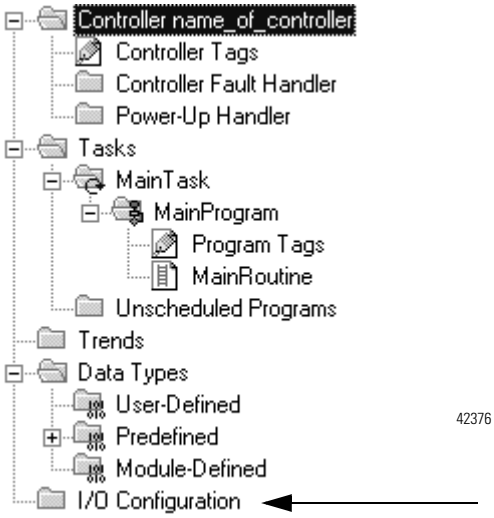
- Add the Remote 1794-ACN Module
- Add I/O Modules
- Create Aliases
- Schedule the ControlNet Network

To check your work, do the following step:

- Validate Connections

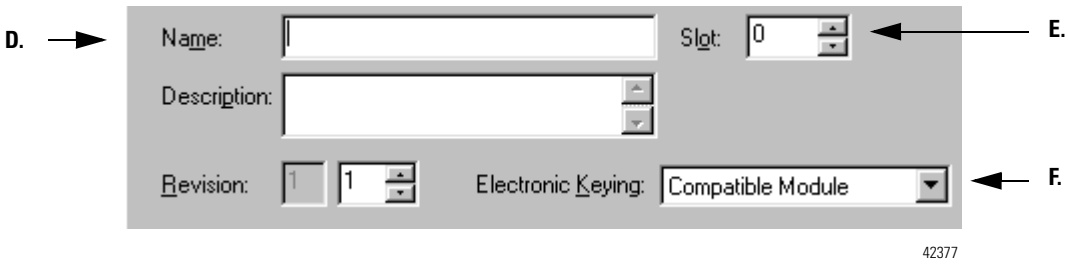
Add the local 1756-CNB module

A. Open the RSLogix 5000™ project offline.



B. Right-click *I/O Configuration* and select *New Module*.

C. Select your type of CNB and click *OK*.



D. Type a name for the module (i.e., `name_of_local_cnb`).

E. Type or select the slot number where the module is installed

F. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.

H. Initially, do you want to the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE

Inhibit a module

Use the Inhibit Module check box to make it easier to test a system:

- Initially, inhibit the module.
- When you are ready to test the devices that are associated with the module, clear the check box.

I. If communication with the module fails, how do you want the controller to respond?

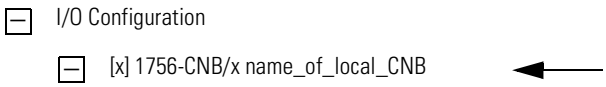
ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

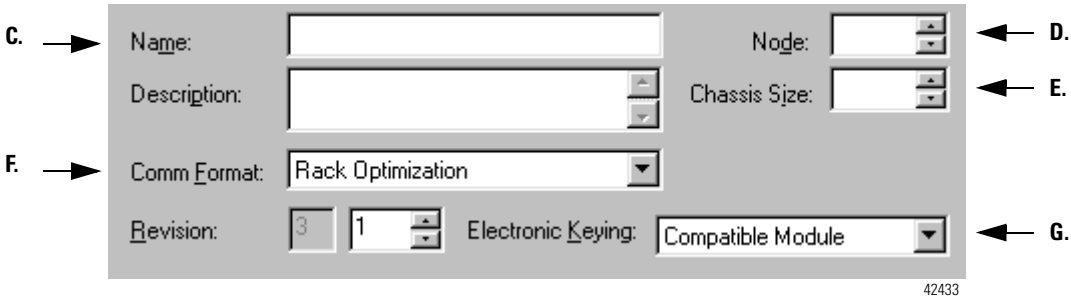
J. Click *Finish*.

Add the Remote 1794-ACN Module



A. Right-click *name_of_local_cnb* and select *New Module*.

B. Select the type of 1794-ACN that you are using and click *OK*.



C. Type a name for the ACN module. Use a name that identifies the I/O of this adapter.

D. Type or select the ControlNet node number of the module.

E. Type or select the number of I/O modules on this rail.

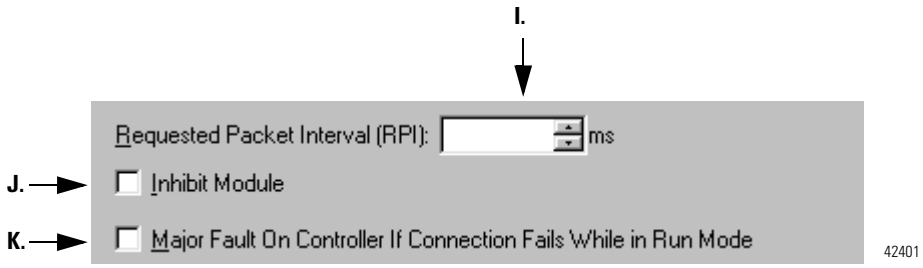
F. Are most of the modules on this rail digital I/O modules?

If:	Then select
Yes	*Rack Optimization*
No	*None*

G. How closely must any module at this location match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

H. Click *Next*.



I. In step F., which Comm Format did you select?

If:	Then:
Rack Optimization	Type the rate at which the fastest device on the rail must update. • Use a power of two times the ControlNet NUT. • For example, if the NUT is 5 ms, type a rate of 5, 10, 20 ms, etc.
None	No RPI is required. Go to the next step.

J. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

K. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

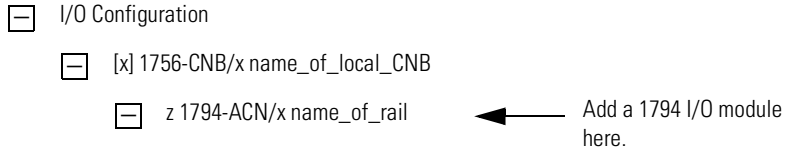
L. Click *Finish*.

Add I/O Modules

In this task, you add I/O modules to the I/O configuration of the controller.

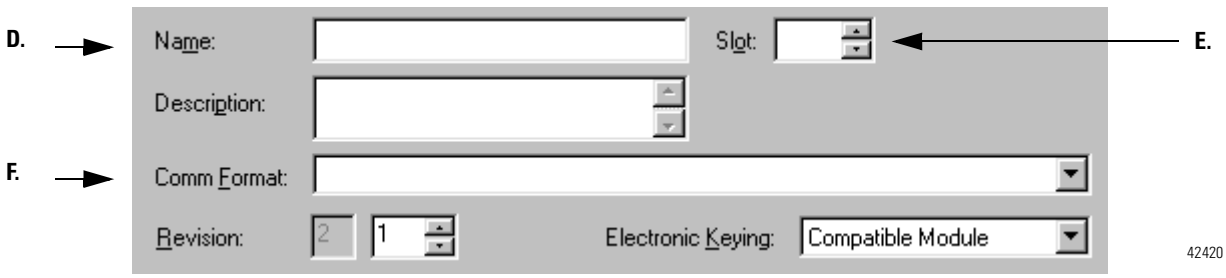
A. Is the module in the I/O configuration of another controller?

If:	And it is an:	And you want to:	Then:
no	→	→	Go to the next step.
yes	output module	→	Go to the next step.
	input module	maintain communication with the module if it loses communication with the other controller	1. Copy the module from the I/O configuration of the other controller. 2. Paste the module into the I/O configuration of this controller. 3. Go to Create Aliases
		stop communication with the module if it loses communication with the other controller	Go to the next step.



B. Right-click the 1794-ACN module and select *New Module*.

C. Select the type of module and click *OK*.



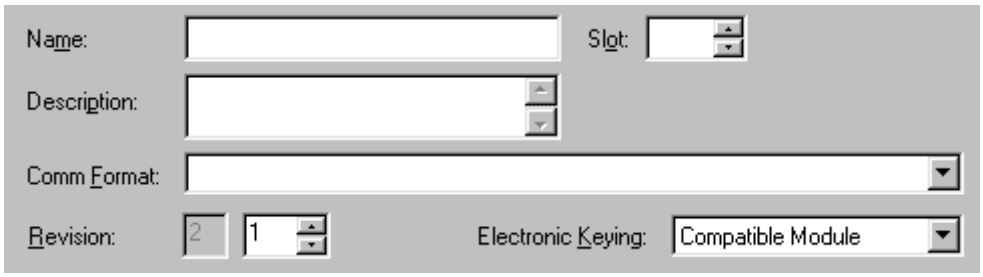
D. Type a name for the module.

E. Type or select the slot number where the module is installed.

F. Select a *Comm Format*:

IMPORTANT If the module is also in the I/O configuration of another controller, then select the *Listen Only* version of the Comm Format (e.g., *Listen Only - Input Data*).

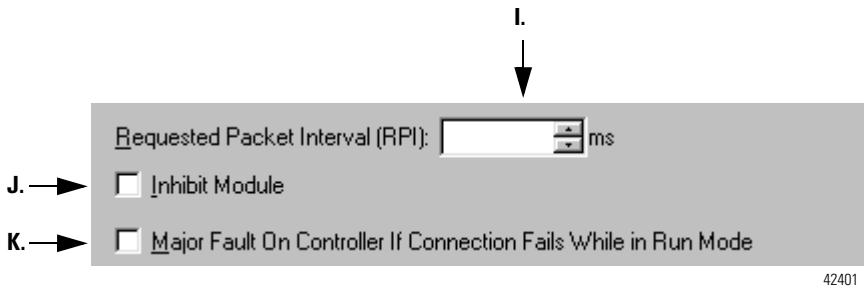
If this module is a:	And the:	And the module must:	Then select:
digital input	Comm Format of the 1794-ACN is *Rack Optimization*	update at the RPI of the 1794-ACN	*Rack Optimization*
		update faster than the RPI of the 1794-ACN	*Input Data*
	Comm Format of the 1794-ACN is *None*	→	*Input Data*
digital input/output	Comm Format of the 1794-ACN is *Rack Optimization*	update at the RPI of the 1794-ACN	*Rack Optimization*
		update faster than the RPI of the 1794-ACN	*Data*
	Comm Format of the 1794-ACN is *None*	→	*Data*
digital output	Comm Format of the 1794-ACN is *Rack Optimization*	update at the RPI of the 1794-ACN	*Rack Optimization*
		update faster than the RPI of the 1794-ACN	*Output Data*
	Comm Format of the 1794-ACN is *None*	→	*Output Data*
analog	→	→	*Data*



G. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

H. Click *Next*.



I. In step F., did you select *Rack Optimization* as the Comm Format?

If:	Then:
No	Type the rate at which the fastest device that is wired to the module must update. • Use a power of two times the ControlNet NUT. • For example, if the NUT is 5 ms, type a rate of 5, 10, 20 ms, etc.
Yes	No RPI is required. Go to the next step.

J. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

K. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

L. Click *Finish*.

Create Aliases

In this task, you convert tags in your programs to aliases for I/O points or channels (devices). As an alias for an I/O point or channel, each tag:

- provides a descriptive name for the device that is wired to the point or channel
- represents the value of the point or channel. When one changes, the other reflects the change.

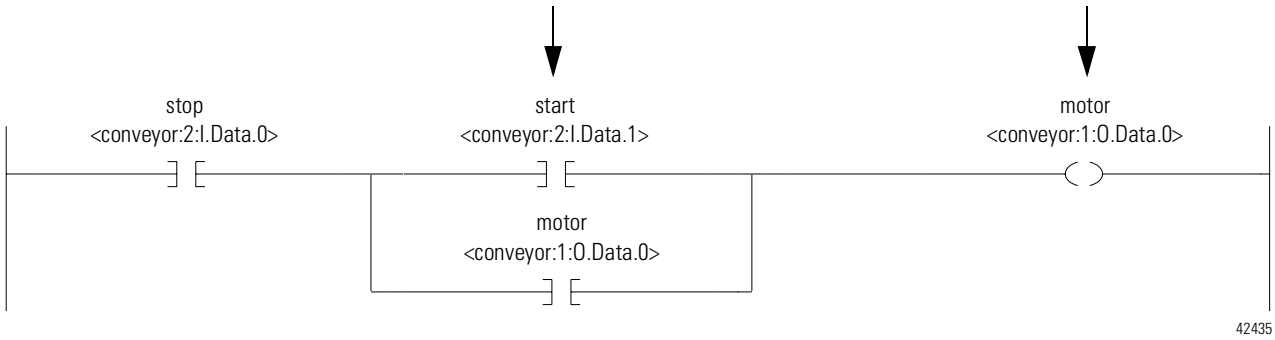
EXAMPLE

Create aliases

The following logic was initially programmed using descriptive tag names, such as *start* and *motor*. Later, the tags were converted to aliases for the corresponding I/O devices.

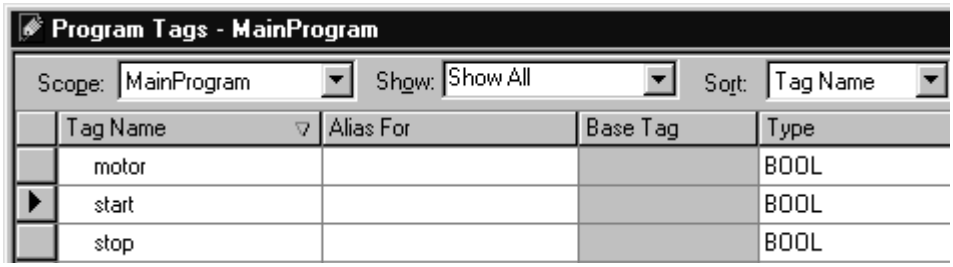
start is an alias for the push button that is wired to point 1 of the module that is in slot 2 of the rail named *conveyor*. When the push button is on, *start* is on.

motor is an alias for the starter contactor that is wired to point 0 of the module that is in slot 1 of the rail named *conveyor*. When *motor* turns on, the starter contactor turns on.



A. From the *Logic* menu, select *Edit Tags*.

B.



C.

B. Select the scope of the descriptive tag.

C. To the right of the tag name, click the *Alias For* cell.

The cell displays a ▼

D. Click the ▼

E. Click the *Controller Scoped Tags* button, if it is available. (All the data for I/O modules is at the controller scope.)

F. Select the I/O device that the tag represents:

If the device is:	And it Comm Format is:	Then:
digital	Data (e.g., Input Data, Output Data)	1. Next to `name:slot:X,` click the + sign. 2. Click the *Data* member. 3. To the right of the *Data* member, click ▼ 4. Click the point number of the device.
	Rack Optimization	1. Click `name:slot:X.` 2. To the right of the selection, click ▼ 3. Click the point number of the device.
analog input	→	1. Next to `name:slot:X,` click the + sign. 2. Scroll down and double-click `Chz`*InputData*.
analog output	→	1. Next to `name:slot:X,` click the + sign. 2. Scroll down and double-click `Chz`*OutputData*.

Where:	Is:	
`name`	name of the 1794-ACN module	
`slot`	slot number of the module	
`X`	type of device:	
	If:	**Then:**
	input	*I*
	output	*O*
`Chz`	channel that the device is wired to	

G. Press the *Enter* key or click another cell.

When you finish, the Tags window should look similar to the following:

Tag Name	Alias For	Base Tag
start	conveyor:2:I.Data.1(C)	conveyor:2:I.Data.1(C)

start is an alias for point 1 of the input module that is in slot 2 of the rail named *conveyor*.

TIP

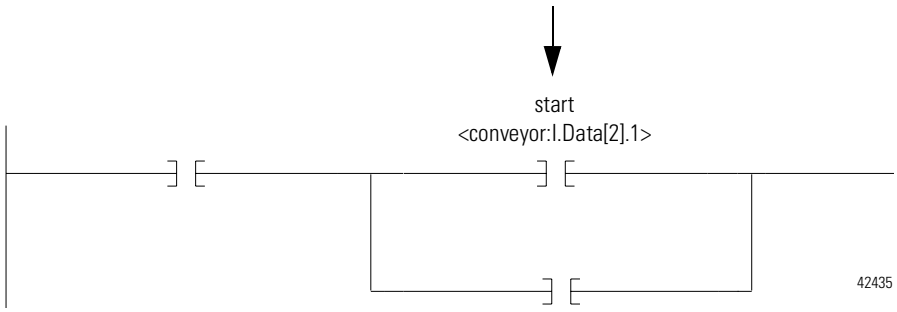
Even if the I/O module uses the Rack Optimization Comm Format, address the required point as described in step F.

Tag Name	Alias For	Base Tag
start	conveyor:2:I.1(C)	conveyor:I.Data[2].1(C)

start is an alias for point 1 of the input module that is in slot 2 of a rail named *conveyor*.

Because the module uses the Rack Optimization format, a structure associated with the ACN module actually transfers the data.

However, the ladder logic displays the address of the data within the ACN structure:



Schedule the ControlNet Network

A. Download the RSLogix 5000 project to the controller.

B. Start RSNetworx™ for ControlNet software.

C. Has this network been scheduled before?

If: No

Then:

1. From the *File* menu, select *New*.
2. From the *Network* menu, select *Online*.
3. Select your ControlNet network and choose *OK*.
4. Select the *Edits Enabled* check box.
5. From the *Network* menu, select *Properties*.
6. From the *Network Parameters* tab, type or select the following parameters:

In this box:	Specify:
Network Update Time	repetitive time interval in which data is sent over the ControlNet network
Max Scheduled Address	greatest node number to use scheduled communications on the network
Max Unscheduled Address	greatest node number that you will use on the network
Media Redundancy	channels in use
Network Name	name for the network

7. Click *OK*.
8. From the *Network* menu, select *Single Pass Browse*.
9. From the *File* menu, select *Save*.
10. Type a name for the file that stores the network configuration, then click *Save*.
11. Select the *Optimize and re-write Schedule for all Connections* button (default) and click *OK*.
12. In RSLogix 5000 software, save the online project.

If: Yes

Then:

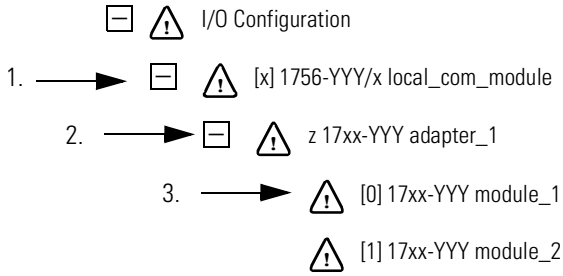
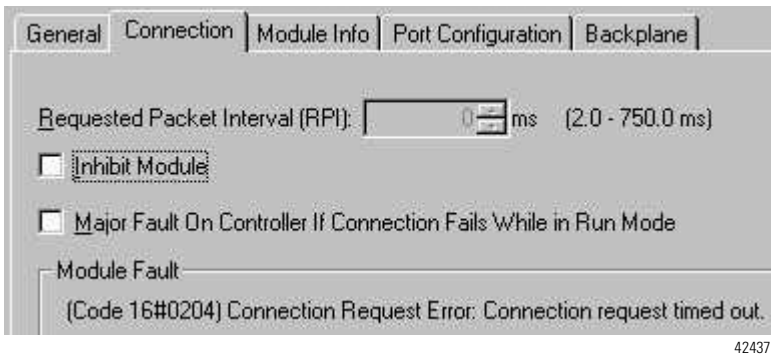
1. From the *File* menu, select *Open*.
2. Select the file for the network and choose *Open*.
3. From the *Network* menu, select *Online*.
4. Select the *Edits Enabled* check box.
5. From the *Network* menu, select *Properties*.
6. From the *Network Parameters* tab, update the following parameters:

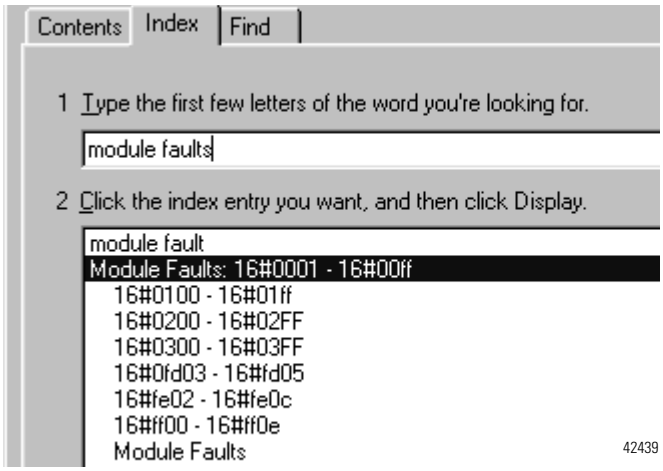
In this box:	Specify:
Max Scheduled Address	greatest node number to use scheduled communications on the network
Max Unscheduled Address	greatest node number that you will use on the network

7. Click *OK*.
8. From the *Network* menu, select *Single Pass Browse*.
9. From the *File* menu, select *Save*.
10. Select the *Optimize and re-write Schedule for all Connections* button (default) and click *OK*.
11. In RSLogix 5000 software, save the online project.

Validate Connections

Is this task, you verify that the controller can communicate with the devices that you have just configured.

Step:	Detailed actions:	
A. Determine if communications are established.	Is a ⚠ over the I/O Configuration folder?	
	If:	**Then:**
	No	The controller can communicate with the module.
	Yes	Communications are not established. Go to the next step.
B. Identify a fault. Start at the local communication module and work down through the tree.		
C. Identify the fault code.	1. Right-click the module and select *Properties*. 2. Click the *Connection* tab.  3. Identify the code for the fault.	

Step:	Detailed actions:
D. Clear the fault.	1. From the *Help* menu, select *Contents*. 2. Click the *Index* tab. 3. Type *module faults*. **4.** →  4. Select the range for the code and click *Display*. 5. Scroll down to your fault code and follow the recommendations.
E. Go to step A.	

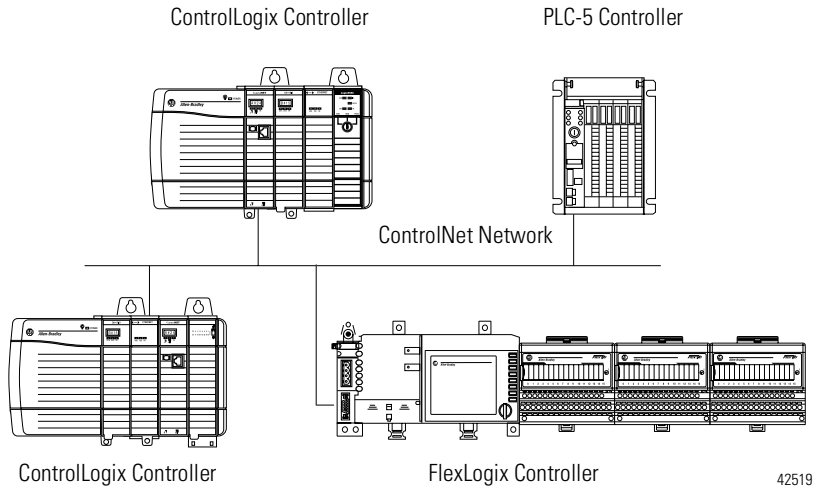
Notes:

Communicate with Another Controller over a ControlNet™ Network

When to Use This Procedure

Use this procedure to send a message from one controller to another controller over an ControlNet network:

- ControlLogix controller to another Controllogix controller
- ControlLogix controller to a FLexLogix™ controller
- ControlLogix controller to a PLC-5® controller
- PLC-5 controller to a ControlLogix controller



How to Use This Procedure

If you have not already done so in a previous procedure, do the following preliminary steps:

- Step 1: Add the 1756-CNB Module
- Step 2: Add the Remote 1756-CNB Module
- Step 3: Add the 1788-CNC Module

To complete this procedure, do the following steps:

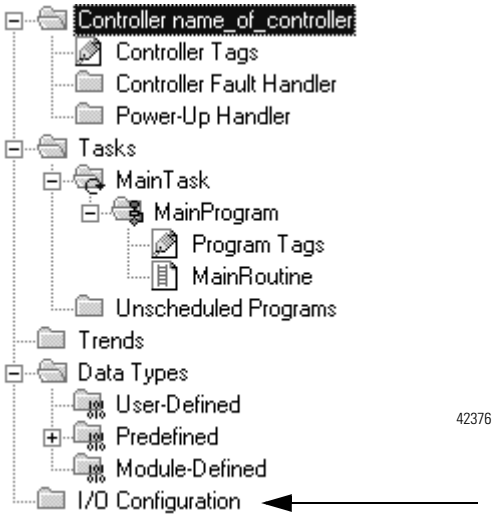
- Step 4: Add the Other Controller
- Step 5: Enter a Message
- Step 6: Configure the Message
- Step 7: Stagger the Messages

If a PLC-5 controller sends the message, do the following step:

- Step 8: Access ControlLogix Data

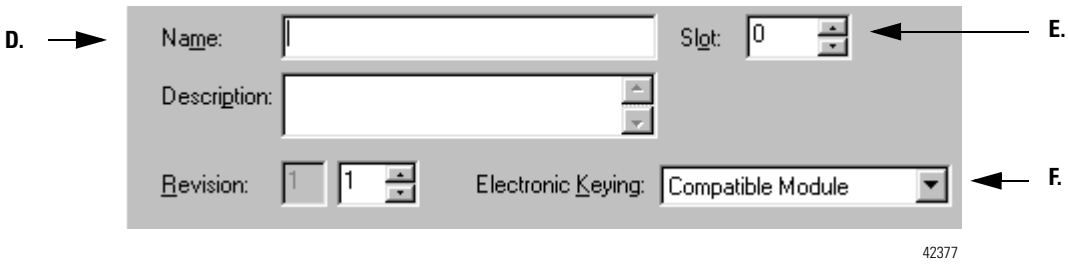
Step 1: Add the 1756-CNB Module

A. Open the RSLogix 5000™ project offline.



B. Right-click *I/O Configuration* and select *New Module*.

C. Select your type of CNB and click *OK*.



D. Type a name for the module (i.e., `name_of_local_cnb`).

E. Type or select the slot number where the module is installed

F. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.

H. Initially, do you want to the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE

Inhibit a module

Use the Inhibit Module check box to make it easier to test a system:

- Initially, inhibit the module.
- When you are ready to test the devices that are associated with the module, clear the check box.

I. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

J. Click *Finish*.

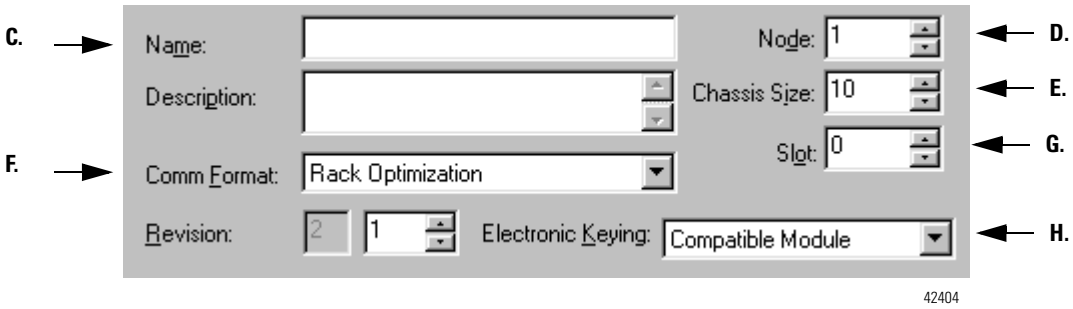
Step 2: Add the Remote 1756-CNB Module

Determine if you must complete this step:

If the other controller is a:	Then:
ControlLogix controller	Complete this step.
FlexLogix controller	Go to Step 3: Add the 1788-CNC Module
PLC-5C controller	Go to Step 4: Add the Other Controller

A. Right-click *name_of_local_cnb* and select *New Module*.

B. Select the type of CNB that is in the remote chassis and click *OK*.



C. Type a name for the CNB module. Use a name that identifies the I/O in the chassis.

D. Type or select the ControlNet node number of the module.

E. Type or select the number of slots in the remote chassis.

F. Are most of the modules in the chassis non-diagnostic, digital I/O modules?

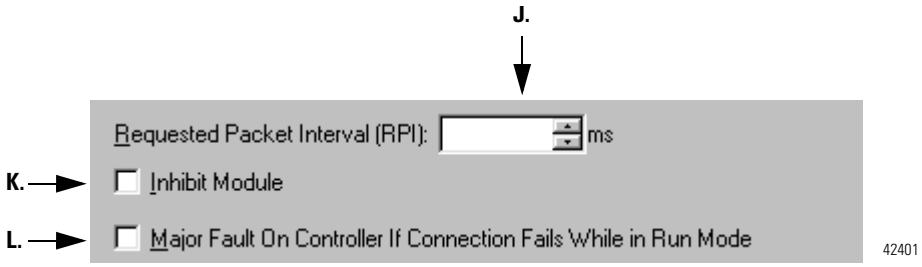
If:	Then select
Yes	*Rack Optimization*
No	*None*

G. Type or select the slot number where the module is installed

H. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

I. Click *Next*.



J. In step F., which Comm Format did you select?

If:	Then:
Rack Optimization	Type the rate at which the fastest device in the chassis must update. • Use a power of two times the ControlNet NUT. • For example, if the NUT is 5 ms, type a rate of 5, 10, 20 ms, etc.
None	No RPI is required. Go to the next step.

K. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

L. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

M. Click *Finish*.

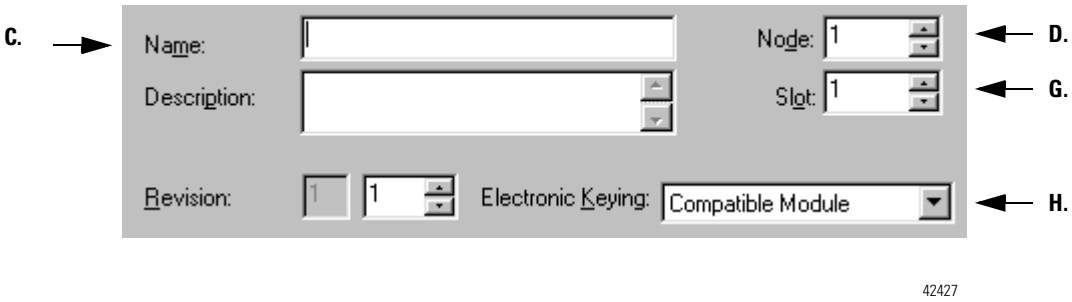
Step 3: Add the 1788-CNC Module

Determine if you must complete this step:

If you are sending a message to a:	Then:
FlexLogix controller	Complete this step.
ControlLogix controller	Go to Step 4: Add the Other Controller
PLC-5C controller	

A. Right-click *name_of_local_cnb* and select *New Module*.

B. Select the type of 1788-CNC module (communication card) that is in the FlexLogix controller and click *OK*.



C. Type a name for the module.

D. Type or select the ControlNet node number of the module.

E. Type or select the slot number where the module is installed (1 or 2).

F. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.

H. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

I. If communication with the modules fails, how do you want the controller to respond?

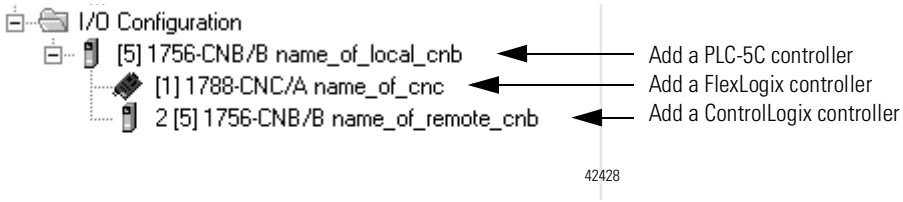
ATTENTION

If communication with a modules fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

J. Click *Finish*.

Step 4: Add the Other Controller



A. What type of controller receives the message?

If it is a:	Then:
PLC-5C	right-click the local 1756-CNB module and select *New Module*.
FlexLogix controller	right-click the 1788-CNC module and select *New Module*.
ControlLogix controller	right-click remote 1756-CNB module and select *New Module*.

B. Select the type of controller and click *OK*.

C. Type the name of the controller.

D. Type or select the location of the controller:

If:	Type or select:
PLC-5C controller	ControlNet node number of the controller
FlexLogix controller	always 0
ControlLogix controller	slot number of the controller

E. How closely must any module in this slot match the information on this tab (does not apply to a FlexLogix controller)?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

F. Click *Next*.

G. Initially, do you want the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE

Inhibit a module

To make it easier to test a system one module or section at a time:

1. Initially, inhibit all the modules.
2. To test a section of the system, clear the check boxes for the modules of that section (i.e., uninhibit the modules).

H. If communication fails, how do you want the controller to respond?

ATTENTION

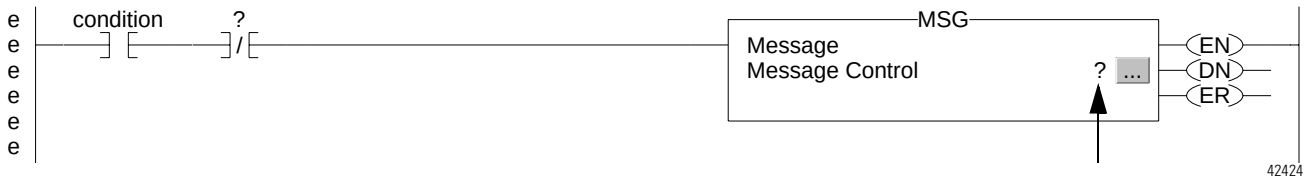
If communication with a modules fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

I. Click *Finish*.

Step 5: Enter a Message

A. Enter a MSG instruction and associated input instruction (s).



B. In the MSG instruction, type a name for the message control tag and press the *Enter* key.

C. In the MSG instruction, right-click the message control tag and select *New* `tag_name.` (In older revisions of the software, the menu option is *Create* `tag_name.`)

D. From the *Scope* list, select `name_of_controller`*(controller)*, and click *OK*.

E. Enter `message.`EN.

where:

`message` is the message control tag from step B.

F. If your message is to a PLC-5® or SLC 500™ controller *and* it reads or writes integers (not REALs), use a buffer of INTs in the message.

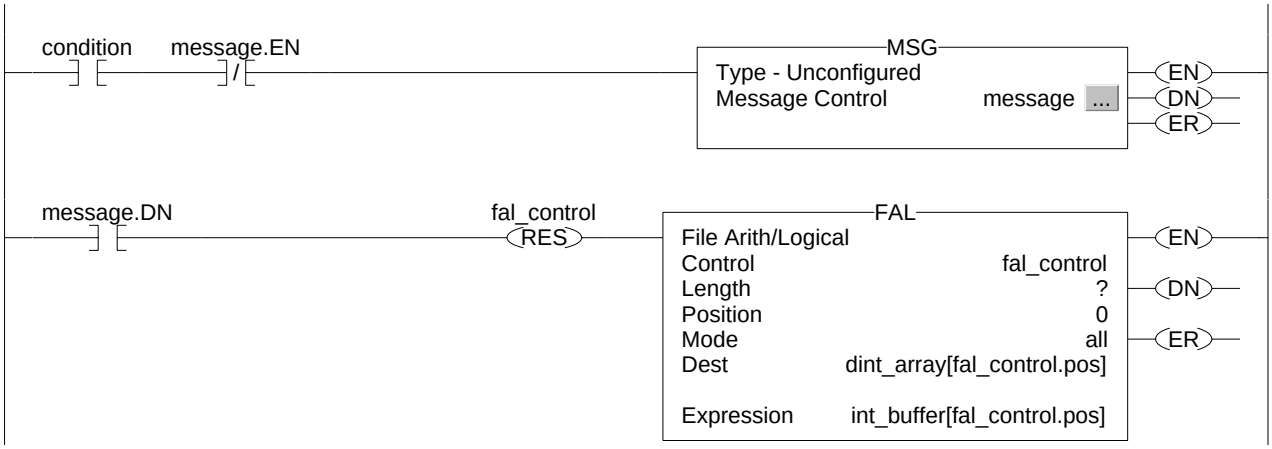
- ControlLogix controllers execute more efficiently and use less memory when working with 32-bit integers (DINTs). Use the DINT data type for integers whenever possible.
- PLC-5 and SLC 500 controllers require 16-bit integers.
- Use an INT buffer in the message and move the data into or out of the buffer as required.

The following examples show how to use a buffer of INTs

EXAMPLE

Read integers from a PLC-5 controller

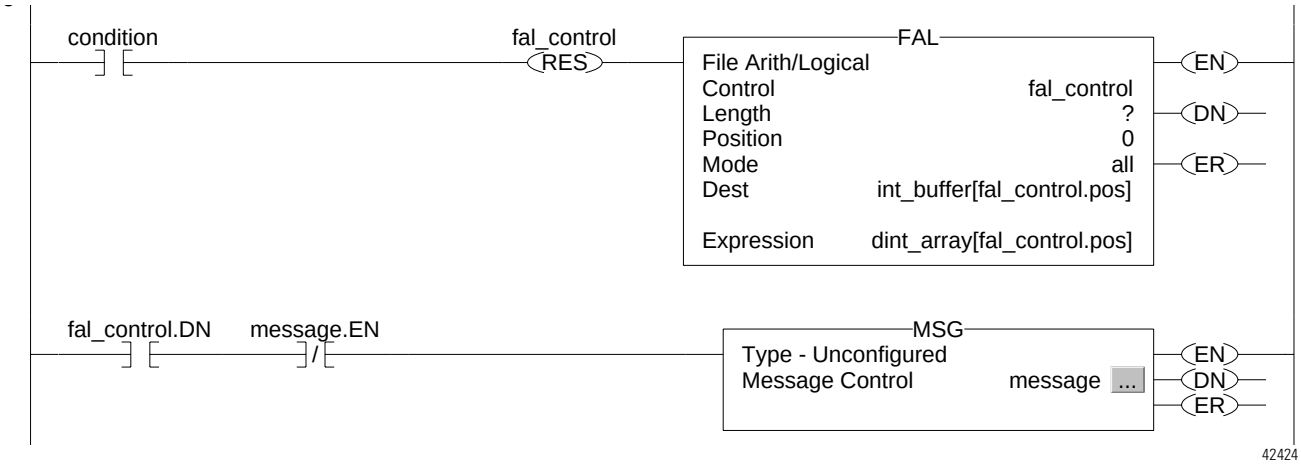
When *condition* turns on, reads 16-bit integer values (INTs) and stores them in *int_buffer*. Then the FAL instruction moves the values to *dint_array*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the ControlLogix controller.



EXAMPLE

Write integers to a PLC-5 controller

When *condition* turns on, moves the values in *dint_array* to *int_buffer*. This converts the values to 16-bit integers (INTs). Then the message instruction sends *int_buffer* to the other controller.



Where:	Is an:
dint_array	array of DINTs that are used in the ControlLogix controller
int_buffer	array of INTs with the same number of elements as *dint_array*

Step 6: Configure the Message

A. In the MSG instruction, click ... .

B. Select a configuration for the message:

Table 11.A Message to a ControlLogix or FlexLogix controller

If you want to:	For this item:	Type or select:
read (receive) the data	Message Type	*CIP Data Table Read*
	Source Element	first element of the tag that contains data in the other controller
	Number Of Elements	number of elements to transfer
	Destination Tag	first element of the tag (controller-scoped) in this controller for the data
write (send) the data	Message Type	*CIP Data Table Write*
	Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
	Number Of Elements	number of elements to transfer
	Destination Element	first element of the tag for the data in the other controller

Table 11.B Message to a PLC-5 controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., F8:0)

C. Click the *Communication* tab.

D. Click *Browse …*

E. Select that controller that receives the message and click *OK*.

F. Complete the communication parameters:

<table>
<tr><th>If the message is to a:</th><th>Then:</th></tr>
<tr><td>PLC-5 controller</td><td>1. Leave the CIP button selected.
2. Disregard the Cache Connection check box.</td></tr>
<tr><td>Logix5000 controller:
• ControlLogix controller
• FlexLogix controller</td><td>How many Logix5000 controllers does this controller send messages to?
<table><tr><th>If:</th><th>Then:</th></tr><tr><td>16 or less Logix5000 controllers</td><td>Leave the Cache Connection check box selected (checked).</td></tr><tr><td>more than 16 Logix5000 controllers</td><td>1. Select16 Logix5000 controllers that require the most frequent messages.
2. Is this message to one of those controllers?
<table><tr><th>If:</th><th>Then</th></tr><tr><td>Yes</td><td>Leave the Cache Connection check box selected (checked).</td></tr><tr><td>No</td><td>Clear the Cache Connection check box.</td></tr></table></td></tr></table></td></tr>
</table>

G. Click *OK*.

Step 7: Stagger the Messages

As you add messages to your project, you may have to coordinate the execution of the messages. To avoid errors and assure that each message is processed, follow these rules:

Rule 1:	Enable no more than 16 messages at one time (including block transfers).
Rule 2:	Enable no more than 10 of the following types of messages at one time: • CIP data table reads or writes that are *not* cached • CIP generic • PLC2, PLC3, PLC5, or SLC (all types) • block transfer reads or writes that are *not* cached

If the number of messages in your application exceeds rules 1 and 2, then stagger the execution of your messages. Here are some options:

- Send each message in sequence
- Send the messages in groups that are within the limits of rules 1 and 2

Step 8: Access ControlLogix Data

Complete this step for any message that a PLC-5C controller sends to a ControlLogix controller over an ControlNet network.

IMPORTANT This procedure uses RSLogix 5™ software, revision 3.x.

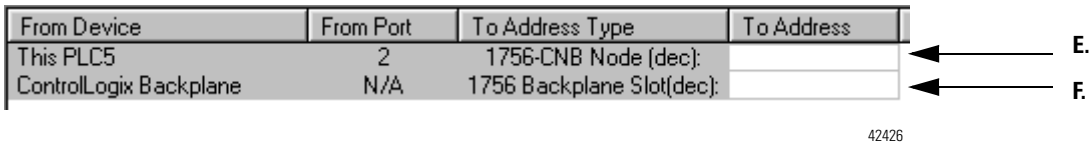
A. Using RSLogix 5 software, open the project for the PLC-5 controller.

B. Display the set-up screen for the message.

C. Specify the following parameters:

For this section:	And this item:	Specify:
This PLC-5	Communication Command	*PLC-5 Typed Read* or *PLC-5 Typed Write*
	Data Table Address	starting address of the data in the PLC-5 controller
	Size in Elements	number of elements to read or write
	Port Number	2
Target Device	Data Table Address	Type, in quotation marks [" "], the name of the tag in the ControlLogix controller (e.g., "count").
	MultiHop	*Yes*.

D. Click the *MultiHop* tab.



E. Type the ControlNet node number of the 1756-CNB module that is in the same chassis as the ControlLogix controller.

F. Type the slot number of the ControlLogix controller.

Notes:

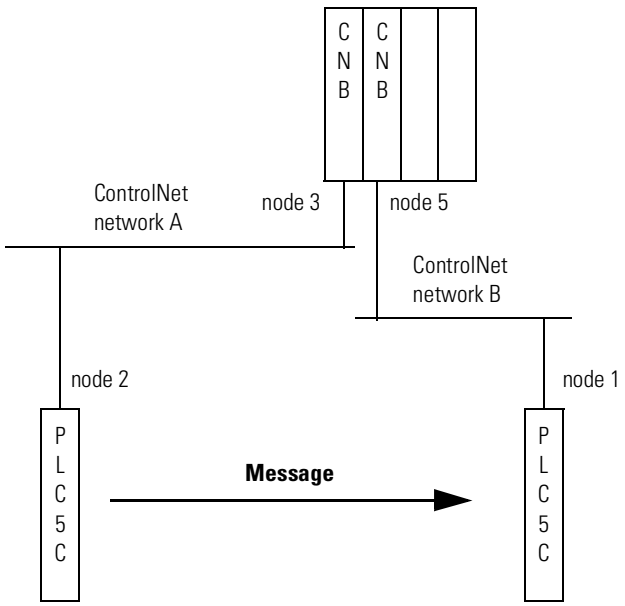
Route PLC-5® Messages Between ControlNet™ Networks

When to Use This Procedure

You can use ControlLogix communication modules to route a message between PLC-5 controllers that are on different networks (i.e., a remote message)

The following example depicts a ControlLogix chassis with two 1756-CNB modules that route a message from a ControlNet network to a different ControlNet network.

EXAMPLE Message from a PLC-5C on a ControlNet network to a PLC-5C on a different ControlNet network



Route a ControlNet Message

To send a message from a PLC-5C controller to a PLC-5C controller on a different ControlNet network:

IMPORTANT This procedure uses RSLogix 5™ software, revision 3.x.

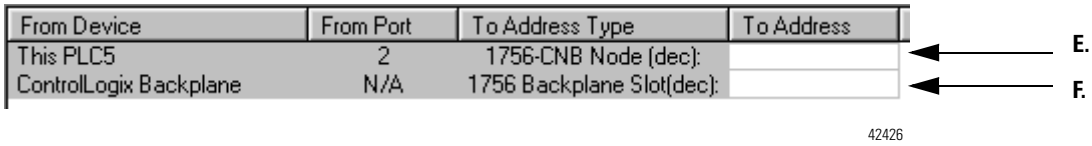
A. Using RSLogix 5 software, open the project for the PLC-5 controller that sends the message.

B. Display the set-up screen for the message.

C. Specify the following parameters:

For this section:	And this item:	Specify:
This PLC-5	Communication Command	*PLC-5 Typed Read* or *PLC-5 Typed Write*
	Data Table Address	starting address of the data in this PLC-5 controller
	Size in Elements	number of elements to read or write
	Port Number	2
Target Device	Data Table Address	starting address of the data in the controller that receives the message
	MultiHop	*Yes*.

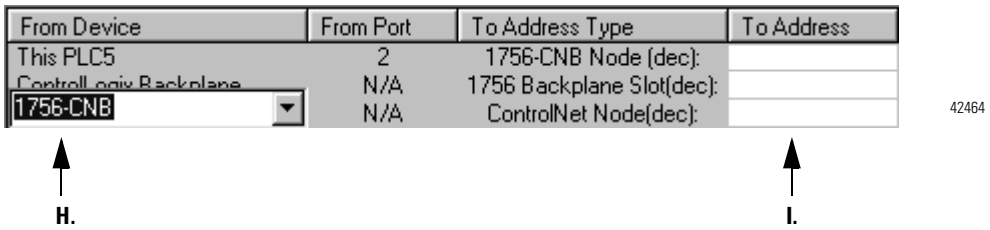
D. Click the *MultiHop* tab.



E. Type the ControlNet node number of the 1756-CNB module that is on the same ControlNet network as the controller that sends the message.

F. Type the slot number of the 1756-CNB module.

G. Press the *Insert* key.



H. Select *1756-CNB*.

I. Type the ControlNet node number of the controller that receives the message.

The following example depicts the MultiHop entries for the example on page 12-1.

EXAMPLE

MultiHop entries

3 1 1

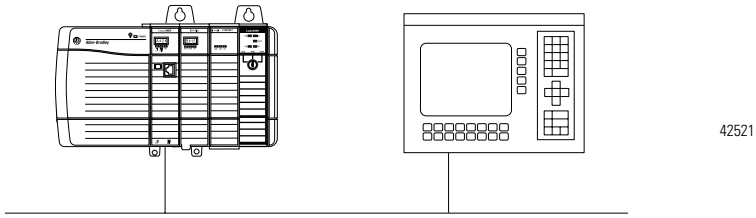
where:	indicates the:
3	node number of the 1756-CNB module on ControlNet network A
1	slot number of the 1756-CNB module on ControlNet network B
1	node number of the PLC-5C controller that is receiving the message

Notes:

Communicate with a PanelView™ Terminal Over a ControlNet™ Network

When to Use This Procedure

Use this procedure to exchange data between a PanelView terminal and a ControlLogix controller over a ControlNet network.



IMPORTANT Before you use this procedure, your system must meet these requirements:

- Each 1756-CNB module communicates with no more than three PanelView terminals.
- Each PanelView terminal communicates scheduled data with only one controller

How to Use This Procedure

If you have not already done so in a previous procedure, do the following preliminary task:

- Add the Local 1756-CNB Module

To complete this procedure, do the following tasks:

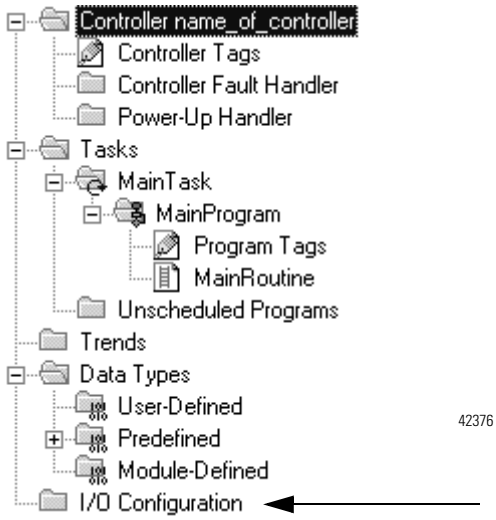
- Add the PanelView Terminal
- Organize Your Scheduled Data
- Organize Your Unscheduled Data
- Configure the PanelView Terminal
- Create PanelView Tags
- Schedule the ControlNet Network

To check your work, do the following task:

- Validate Connections

Add the Local 1756-CNB Module

A. Open the RSLogix 5000™ project offline.



B. Right-click *I/O Configuration* and select *New Module*.

C. Select your type of CNB and click *OK*.

D. Type a name for the module (i.e., *name_of_local_cnb*).

E. Type or select the slot number where the module is installed

F. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.

H. Initially, do you want to the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE

Inhibit a module

Use the Inhibit Module check box to make it easier to test a system:

- Initially, inhibit the module.
- When you are ready to test the devices that are associated with the module, clear the check box.

I. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

J. Click *Finish*.

Add the PanelView Terminal

A. Right-click *name_of_local_cnb* and select *New Module*.

B. Select *PanelView* and click *OK*.

C. Type a name for the PanelView terminal.

D. Type or select the ControlNet node number of the terminal.

E. Does the terminal read more than 8 words of scheduled data (16-bit integers) or write more than 8 words of scheduled data?

If:	Then select
up to 8	*Data - 8 INT*
more than 8	*Data - 32 INT*

EXAMPLE

Select a Comm Format

If the PanelView terminal writes:

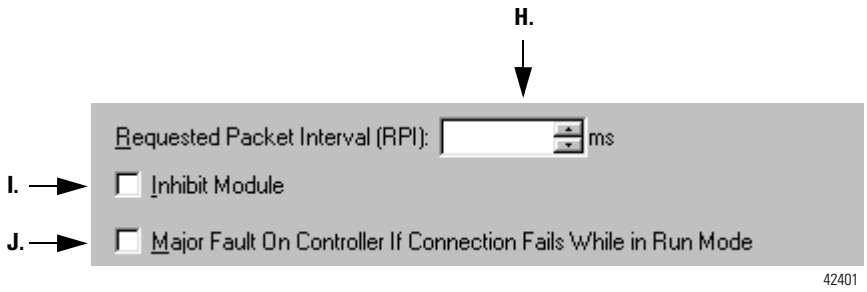
- 45 time-critical bits (45 ÷ 16 = 3 integers)
- 4 time-critical integers

Then the terminal writes 7 time-critical integers, so select *Data - 8 INT*.

F. How closely must the PanelView terminal match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.



H. Type the rate that you want scheduled data to transfer with the PanelView terminal.

- Use a power of two time the ControlNet NUT.
- For example, if the NUT is 5ms, type a rate of 10, 20ms, etc.

I. Initially, do you want the module to communicate with the controller?

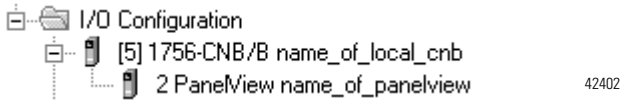
If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

J. If communication with the modules fails, how do you want the controller to respond?

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

K. Click *Finish*.

Your controller organizer should look similar to the following:



Organize Your Scheduled Data

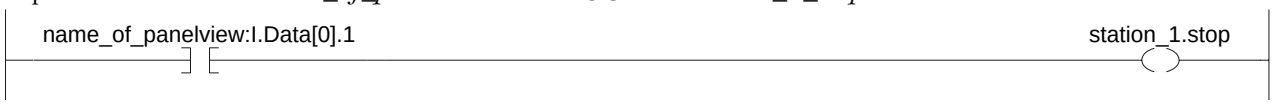
To transfer time-critical data, use the scheduled communications between the controller and the PanelView terminal:

If data type of the tag is:	And it is:	And the:	Then:
BOOL	part of a structure or array	PanelView writes the data	Copy *name_of_panelview:I.Data[x].y* to the tag.
		PanelView reads the data	Copy the tag to *name_of_panelview:O.Data[x].y*
	not part of a structure or array	PanelView writes the data	Convert the tag to an alias for *name_of_panelview:I.Data[x].y*
		PanelView reads the data	Convert the tag to an alias for *name_of_panelview:O.Data[x].y*
DINT	→	PanelView writes the data	Move *name_of_panelview:I.Data[z]* to the tag.
		PanelView reads the data	Move the tag to *name_of_panelview:O.Data[z]*

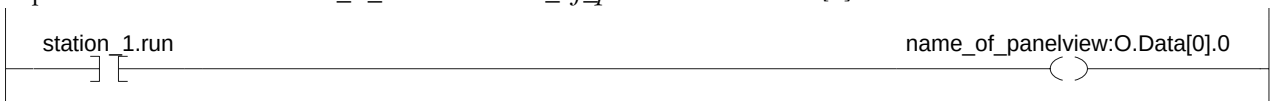
Where:	Is:
name_of_panelview	name of the PanelView terminal in the I/O configuration of the controller
x	element of the PanelView terminal input (I) or output (O) structure. You can use this element for up to 16 bits.
y	bit number 0 to 15 within the input or output element
z	unique element of the PanelView terminal input (I) or output (O) structure

EXAMPLE Organize scheduled (i.e., time-critical) data

Copies the value of *name_of_panelview:I.Data[0].1* to *station_1_stop*.

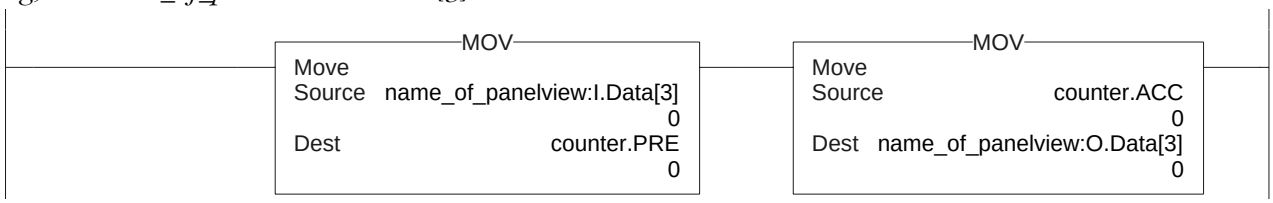


Copies the value of *station_1_run* to *name_of_panelview:O.Data[0].0*.



alarm_ack and *alarm* are aliases for data that the PanelView terminal writes and reads

Moves *name_of_panelview:I.Data[3]* to counter.PRE (a DINT tag) and moves counter.ACC (a DINT tag) to *name_of_panelview:O.Data[3]*



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Organize Your Unscheduled Data

To transfer unscheduled data with the PanelView terminal, organize the tags in the ControlLogix controller as follows:

If data type of the tag is:	And it is:	And the:	Then:
BOOL	part of a structure or array (including an I/O device)	PanelView writes the data	a. Create a tag of the DINT data type. b. Copy bit *z* of the DINT tag to the BOOL tag.
		PanelView reads the data	a. Create a tag of the DINT data type. b. Copy the BOOL tag to bit *z* of the DINT tag.
	not part of a structure or array	→	a. Create a tag of the DINT data type. b. Convert the BOOL tag to an alias for bit *z* of the DINT tag.
DINT	≤ 32767	PanelView writes the data	a. Create a tag of the INT data type. b. Move the INT tag to the DINT tag.
		PanelView reads the data	a. Create a tag of the INT data type. b. Move the DINT tag to the INT tag.
DINT	> 32767	PanelView writes the data	a. Create a tag of the REAL data type. b. Move the REAL tag to the DINT tag.
		PanelView reads the data	a. Create a tag of the REAL data type. b. Move the DINT tag to the REAL tag.

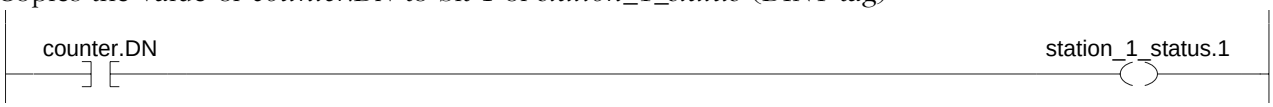
where:

z is bit 0 to 15 of the DINT tag.

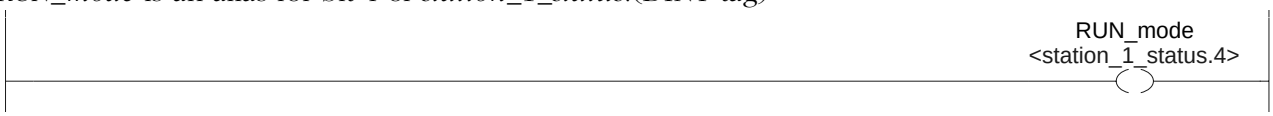
EXAMPLE Organize unscheduled (i.e., *not* time-critical) data

Copies the value of bit 3 of *station_1_status* (DINT tag) to *station_1.start* (a member of the *station_1* structure)

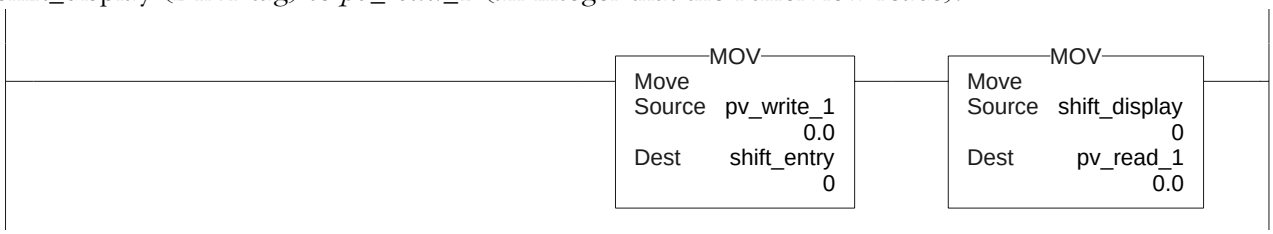
Copies the value of *counter.DN* to bit 1 of *station_1_status* (DINT tag)



RUN_mode is an alias for bit 4 of *station_1_status*.(DINT tag)



Moves *pv_write_1* (an integer that the PanelView writes) to shift_entry (DINT tag) and moves shift_display (DINT tag) to *pv_read_1* (an integer that the PanelView reads).



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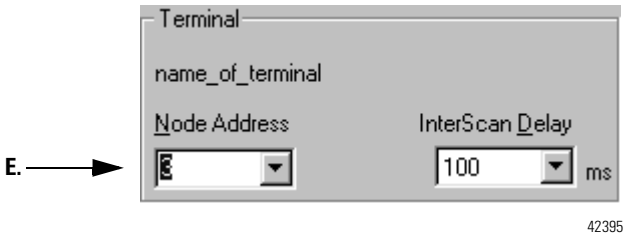
Configure the PanelView Terminal

A. Start PanelBuilder32 software.

B. Open an existing PanelBuilder application or create a new application.

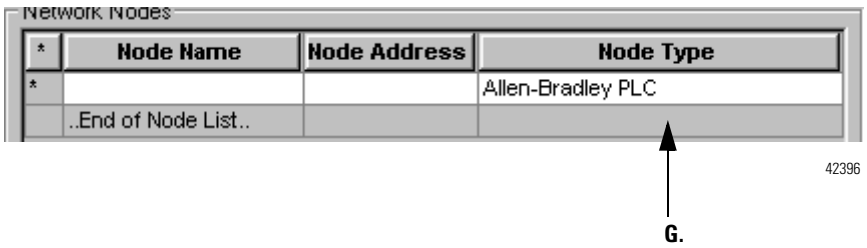
C. From the *Application* menu, select *Settings*.

D. Click the *Comms Setup* button.

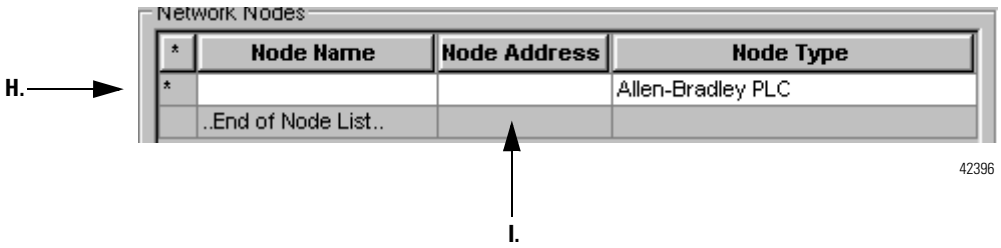


E. Type the ConrolNet node number of the PanelView terminal.

F. Under *Node Name*, right-click *End of Node List* and select *Insert Node*.



G. Select *ControlLogix5000*.



H. Type a name for the ControlLogix controller.

I. Type the path to the ControlLogix controller. Use the following format:

space

cnb_address 1 *controller_slot*

where:	is:
cnb_address	ControlNet node number of the 1756-CNB module that is in the same chassis as the ControlLogix controller
controller_slot	slot number of the ControlLogix controller

J. Click *OK*.

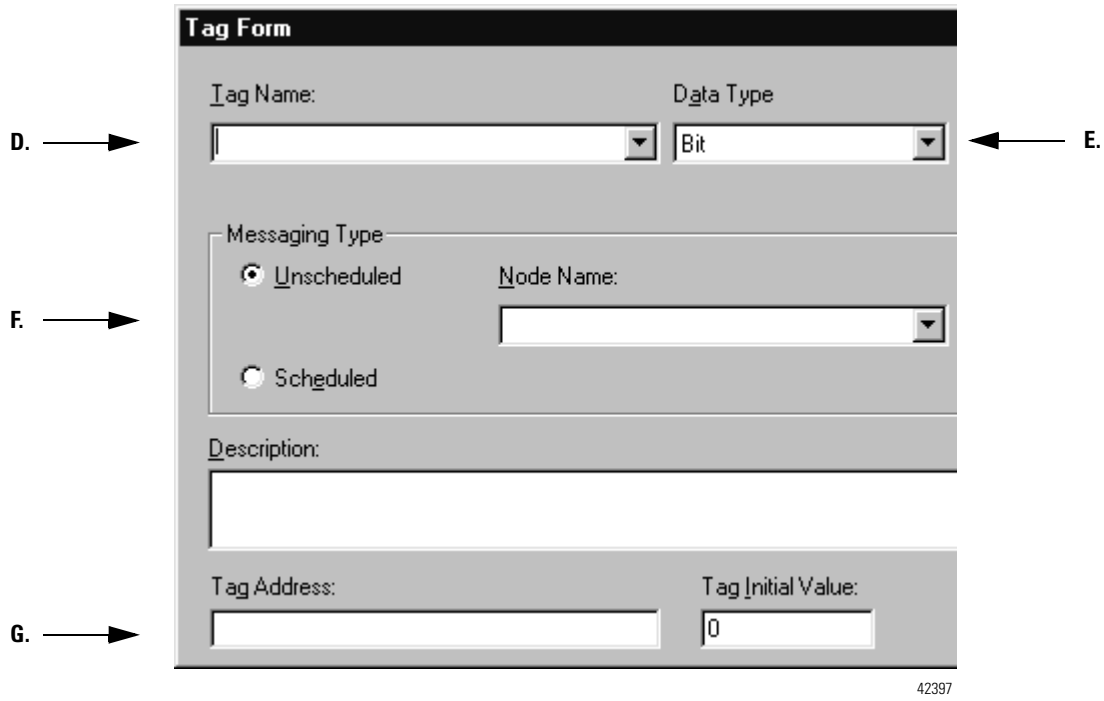
K. Click *OK*.

Create PanelView Tags

A. On the PanelView screen, create the required object.

B. Double-click the object.

C. Click the *Edit Tag* button.



D. Type a name for the object

E. Select a data type that matches the data type of the tag in the ControlLogix controller.

F. In the ControlLogix controller is the data scheduled or unscheduled?

If:	Then:
scheduled	Click the *Scheduled* button.
unscheduled	1. Click the *Unscheduled* button. 2. From the *Node Name* list, select the controller.

G. Specify the name of the tag in the ControlLogix controller:

If the tag is:	And its data type is:	And the:	Specify:
scheduled	bit	PanelView writes the data	`SI0:`*`x/y`*
		PanelView reads the data	`SO0:`*`x/y`*
	INT	PanelView writes the data	`SI0:`*`x`*
		PanelView reads the data	`SO0:`*`x`*
unscheduled	bit	→	*`tag_name.z`*
	INT	→	name of INT or REAL tag that stores the data in the ControlLogix controller
	REAL		

Where:	Is:
x	element of the PanelView input or output structure in the controller
y	bit number 0 to 15 within the input or output element
tag_name	name of the tag that you created in the controller to exchange bits with the PanelView terminal
z	bit number 0 to 15

EXAMPLE Specify the address of a tag in the ControlLogix controller

ControlLogix Controller:	PanelView Application:
name_of_panelview:I.Data[0].1	SI0:0.1
name_of_panelview:O.Data[3]	SO0:3
station_1_status.3	station_1_status.3
pv_write_1	pv_write_1

H. Click *OK*.

I. Click *OK*.

Schedule the ControlNet Network

A. Download the RSLogix 5000 project to the controller.

B. Download the PanelBuilder32 application to the terminal.

C. Start RSNetworx™ for ControlNet software.

D. Has this network been scheduled before?

If: No

Then:

1. From the *File* menu, select *New*.
2. From the *Network* menu, select *Online*.
3. Select your ControlNet network and choose *OK*.
4. Select the *Edits Enabled* check box.
5. From the *Network* menu, select *Properties*.
6. From the *Network Parameters* tab, type or select the following parameters:

In this box:	Specify:
Network Update Time	repetitive time interval in which data is sent over the ControlNet network
Max Scheduled Address	greatest node number to use scheduled communications on the network
Max Unscheduled Address	greatest node number that you will use on the network
Media Redundancy	channels in use
Network Name	name for the network

7. Click *OK*.
8. From the *Network* menu, select *Single Pass Browse*.
9. From the *File* menu, select *Save*.
10. Type a name for the file that stores the network configuration, then click *Save*.
11. Select the *Optimize and re-write Schedule for all Connections* button (default) and click *OK*.
12. In RSLogix 5000 software, save the online project.

If: Yes

Then:

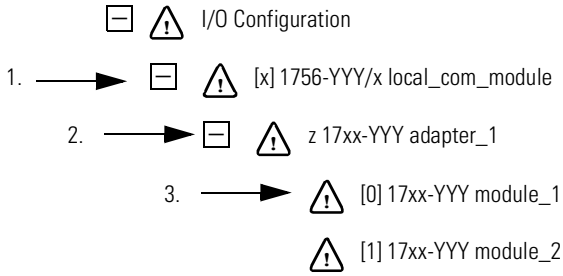
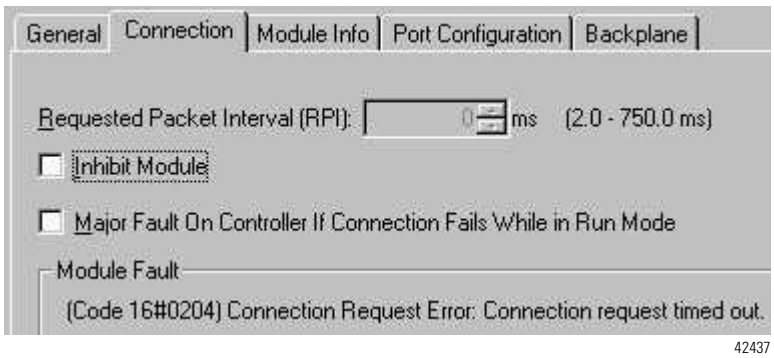
1. From the *File* menu, select *Open*.
2. Select the file for the network and choose *Open*.
3. From the *Network* menu, select *Online*.
4. Select the *Edits Enabled* check box.
5. From the *Network* menu, select *Properties*.
6. From the *Network Parameters* tab, update the following parameters:

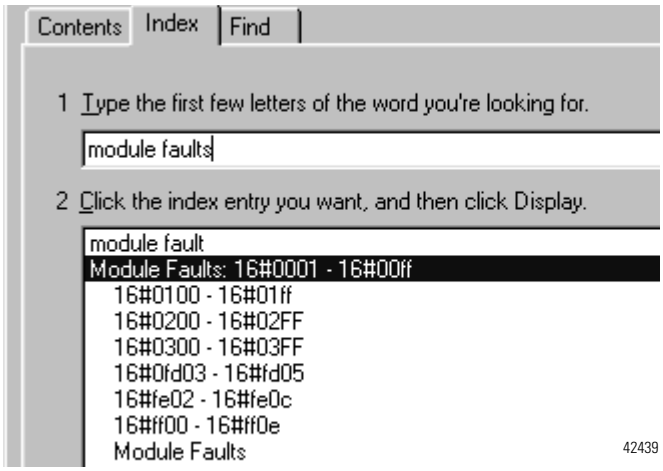
In this box:	Specify:
Max Scheduled Address	greatest node number to use scheduled communications on the network
Max Unscheduled Address	greatest node number that you will use on the network

7. Click *OK*.
8. From the *Network* menu, select *Single Pass Browse*.
9. From the *File* menu, select *Save*.
10. Select the *Optimize and re-write Schedule for all Connections* button (default) and click *OK*.
11. In RSLogix 5000 software, save the online project.

Validate Connections

Is this task, you verify that the controller can communicate with the devices that you have just configured.

Step:	Detailed actions:	
A. Determine if communications are established.	Is a ⚠ over the I/O Configuration folder?	
	If:	**Then:**
	No	The controller can communicate with the module.
	Yes	Communications are not established. Go to the next step.
B. Identify a fault. Start at the local communication module and work down through the tree.		
C. Identify the fault code.	1. Right-click the module and select *Properties*. 2. Click the *Connection* tab. 3.  42437 3. Identify the code for the fault.	

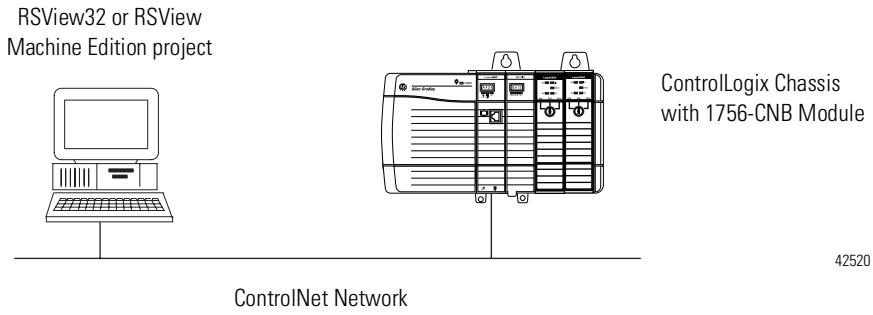
Step:	Detailed actions:
D. Clear the fault.	1. From the *Help* menu, select *Contents*. 2. Click the *Index* tab. 3. Type *module faults*. **4.**  4. Select the range for the code and click *Display*. 5. Scroll down to your fault code and follow the recommendations.
E. Go to step A.	

Communicate with an RSView Project over a ControlNet™ Network

When to Use This Procedure

Use this procedure to communicate with tags in either of the following types of RSView projects:

- RSView32 project.
- RSView Machine Edition project (developed with RSView Studio software)



How to Use This Procedure

To communicate with an RSView project, you have two options:

If the data:	Then use a:
needs regular delivery at a rate that you specify	polled message
is sent when a specific condition occurs in your application	unsolicited message

Configure a ControlNet Driver

A. Start RSLinx™ software.

B. From the *Communications* menu, select *Configure Drivers*.

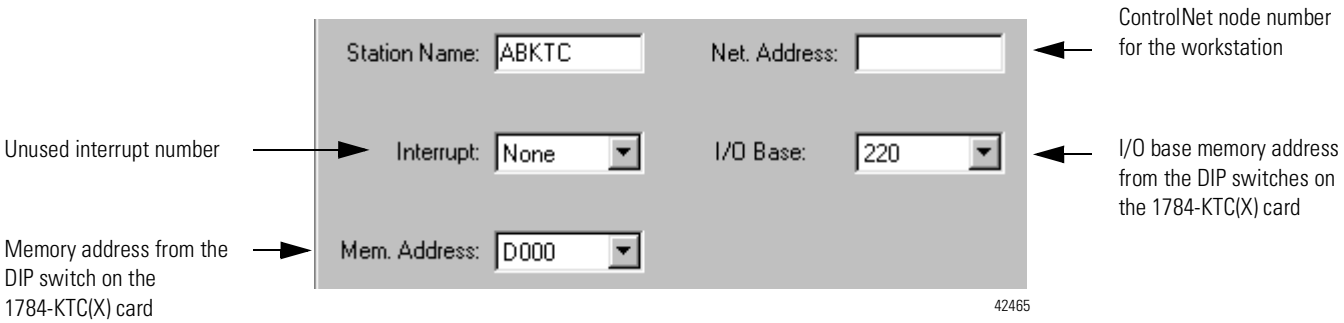
C. From the *Available Driver Types* list, select the type of ControlNet communication card.

D. Click *Add New*.

E. Assign a name to the driver, if desired.

F. Supply the required information about the communication card.

EXAMPLE Configure a 1784-KTC(X) card



G. Click *OK*.

H. Click *Close*.

Select a Communication Method

Select a method for transferring the data:

If the data:	Then go to:
needs regular delivery at a rate that you specify	"Create a Polled Topic" on page 14-4
is sent when a specific condition occurs in your application	"Create a Unsolicited Topic" on page 14-14

Create a Polled Topic

TIP

RSLogix 5000 software, revision 10.0 or later, automatically creates DDE/OPC topics in RSLinx software whenever you:

- create a project
- save a project
- change the revision of a project to 10.0 or later

In some cases, you have to update the data source for the topic in RSLinx software, as shown in steps E - G of this section.

A. Display RSLinx software.

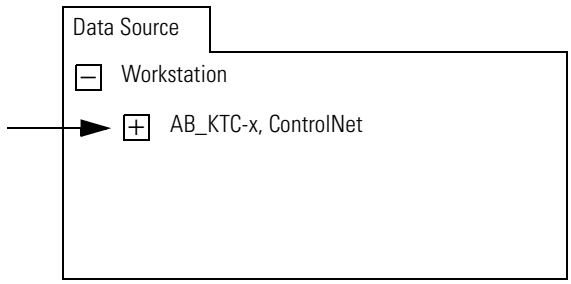
B. From the *DDE/OPC* menu, select *Topic Configuration …*

C. In the bottom left corner of the window, click *New*.

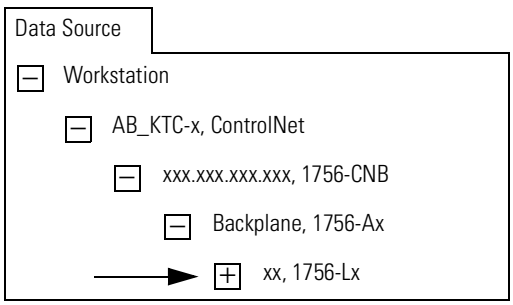
D. Type a name for the topic and press the *Enter* key.

To expand a network one level, do one of the following:

- Double-click the network.
- Select the network and press the → key.
- Click the + sign.



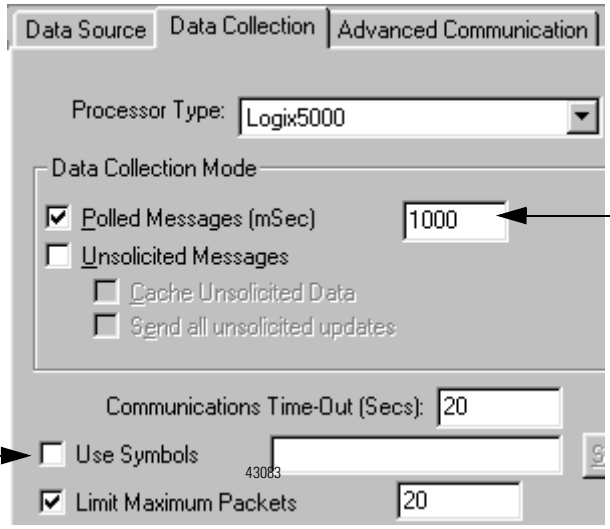
E. On the *Data Source* tab, expand the ControlNet driver (e.g., AB_KTC-1) until you see the ControlLogix controller.



F. Select the ControlLogix controller.

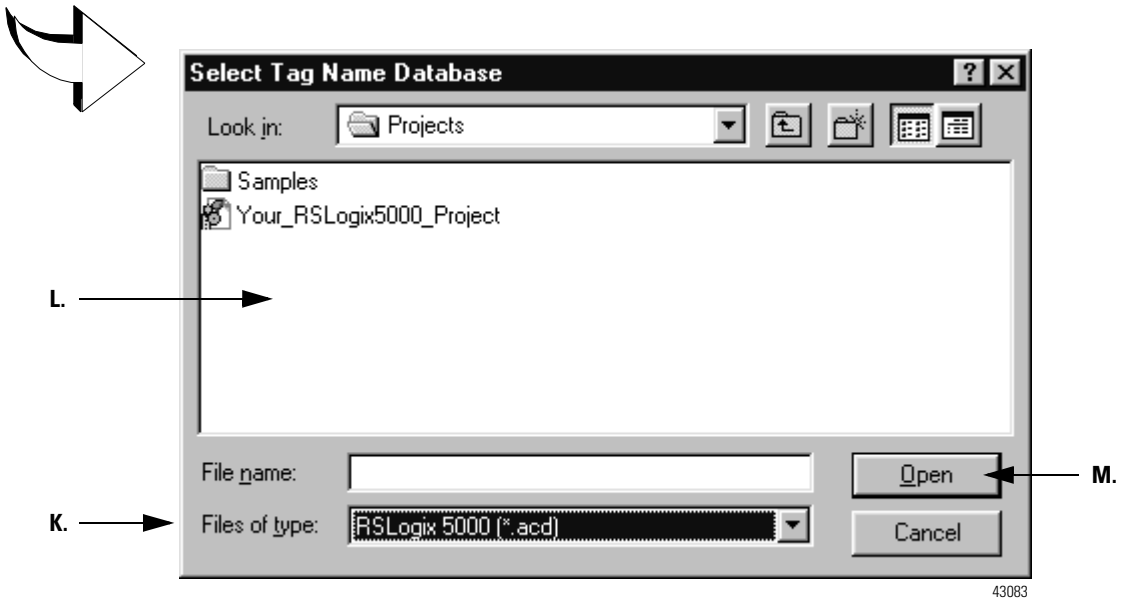
G. Choose *Apply* and confirm the update.

H. Click the *Data Collection* tab.



I. Type the update rate (ms) for the data.

J. Click the *Use Symbols* check box.



K. Select *RSLogix 5000 (*acd)*.

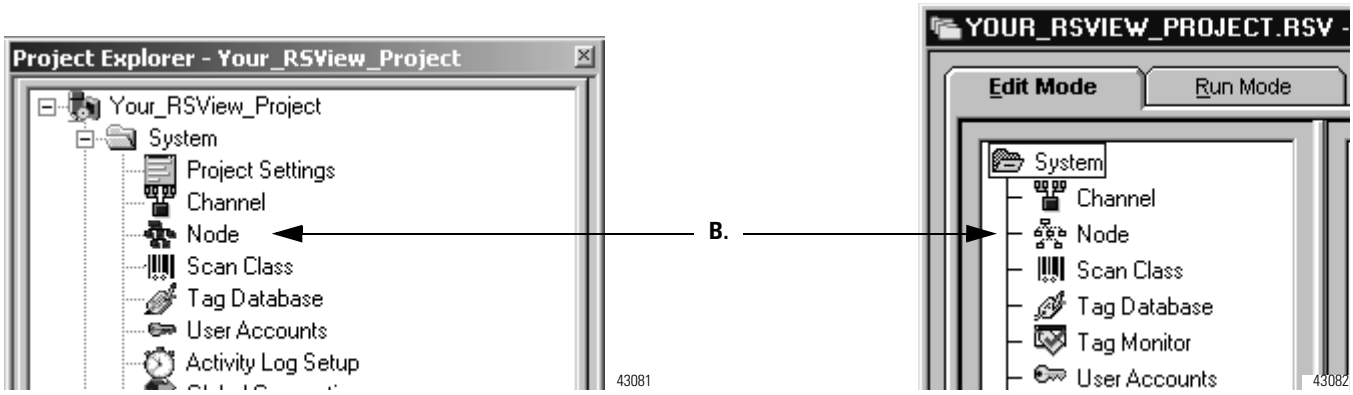
L. Select the RSLogix 5000 project for this topic.

M. Choose *Open*.

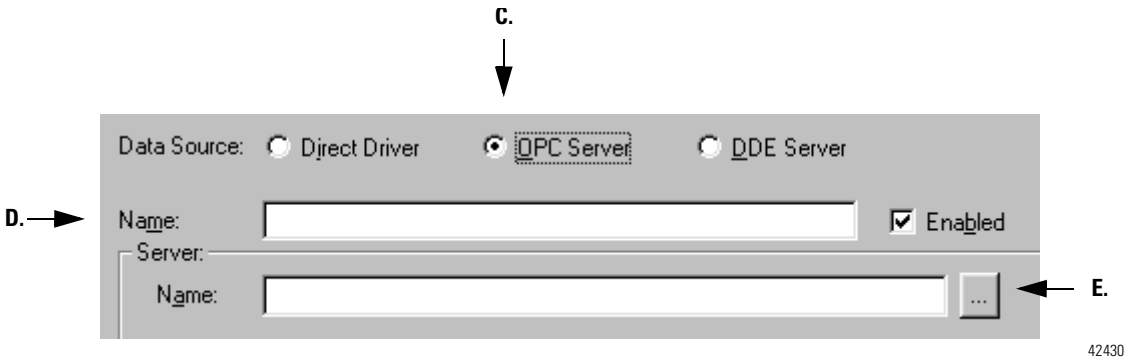
N. Choose *Done* and then *Yes*.

Create a Polled Node

A. Open the RSView project.



B. Double-click *Node*.



C. Click *OPC Server*.

D. Type a name for the node.

E. Click ....

F. Select *RSLinx OPC Server* and click *OK*.

G. Click *Accept*.

H. Click *Close*.

Import Logix5000 Tags

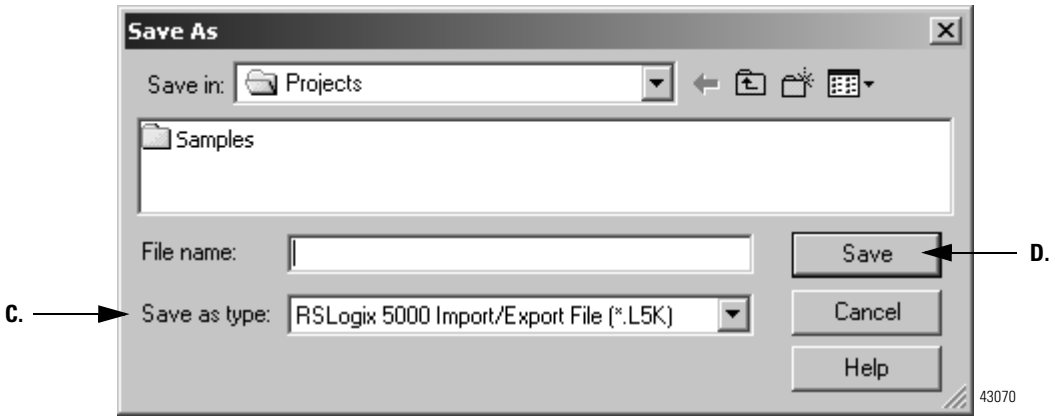
To import tags from an RSLogix 5000 project into your RSView project, use the Logix 5000 Tag Import utility:

- Create an .L5K File
- Install the Logix 5000 Tag Import Utility
- Use the Utility to Create a .CSV File
- Import the .CSV File

Create an .L5K File

A. Open the RSLogix 5000 project that contains the tags that you want to access.

B. From the *File* menu, choose *Save As*.



C. Select *RSLogix 5000 Import/Export File (*.L5K)*.

D. Choose *Save*.

Install the Logix 5000 Tag Import Utility

A. Get your RSLogix 5000 software CD.

B. On the CD, find the following file:

language \Tools\Tag Import Utility\Logix+5000+Tag+Import.msi.

where:

language is the language of your software. For example, for software that is in English, open the Enu folder.

C. Copy the file to your computer.

D. To install the utility, open the file.

Use the Utility to Create a .CSV File

A. Start the Logix 5000 Tag Import utility.

B. Type the name of the node from "Create a Polled Node."

C. Select the .L5K file.

D. Choose *Search*.

E. Select the tags to import.

F. Type the name of the topic from "Create a Polled Topic."

G. Choose *OK*.

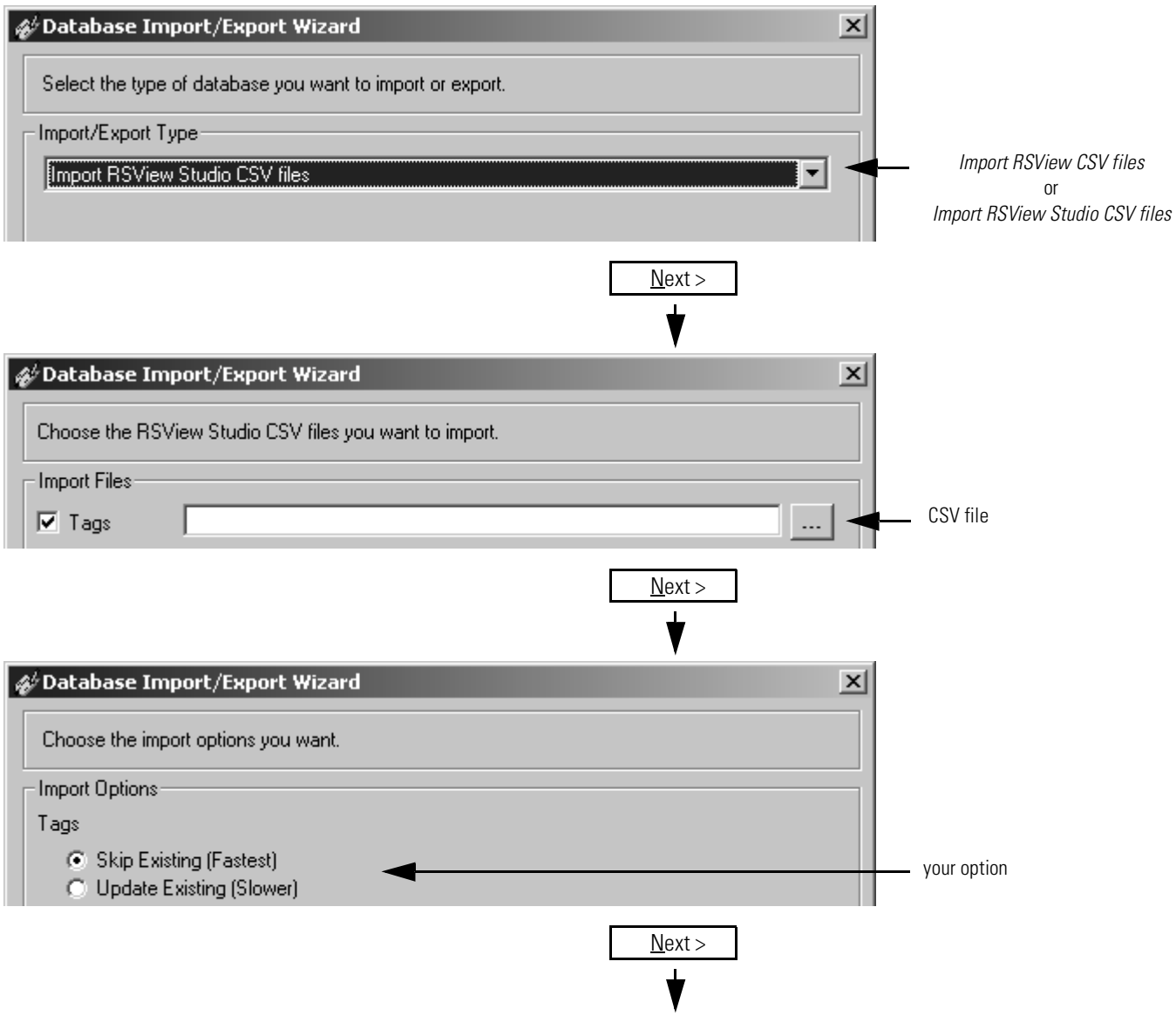
H. Choose *Save*.

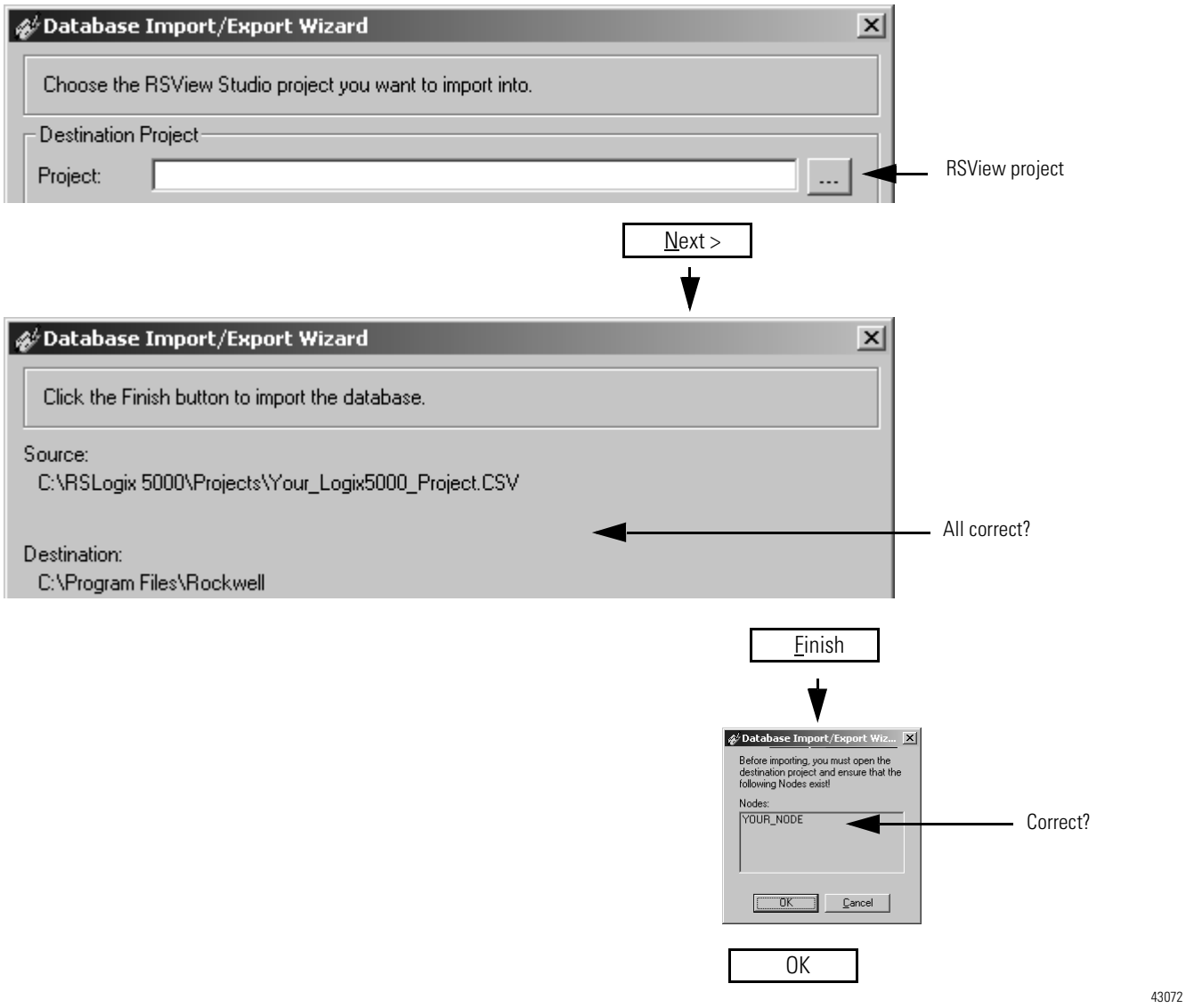
Import the .CSV File

A. Start the Database Import & Export wizard:

- Start ⇒ Programs ⇒ Rockwell Software ⇒ RSView Studio Tools ⇒ Database Import & Export Wizard
- Start ⇒ Programs ⇒ Rockwell Software ⇒ RSView32 Tools ⇒ Database Import & Export Wizard

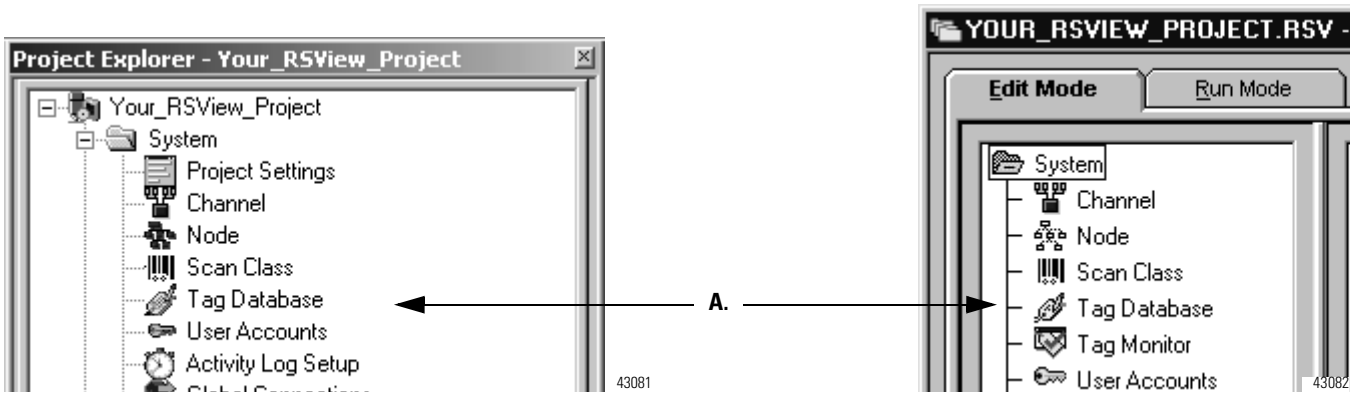
B. Complete the screens of the wizard:




Database Import/Export Wizard
Choose the RSView Studio project you want to import into.
Destination Project
Project:
...
RSView project
Next >
Database Import/Export Wizard
Click the Finish button to import the database.
Source:
C:\RSLogix 5000\Projects\Your_Logix5000_Project.CSV
Destination:
C:\Program Files\Rockwell
All correct?
Finish
Database Import/Export Wiz...
Before importing, you must open the destination project and ensure that the following Nodes exist!
Nodes:
YOUR_NODE
OK
Cancel
Correct?
OK
43072

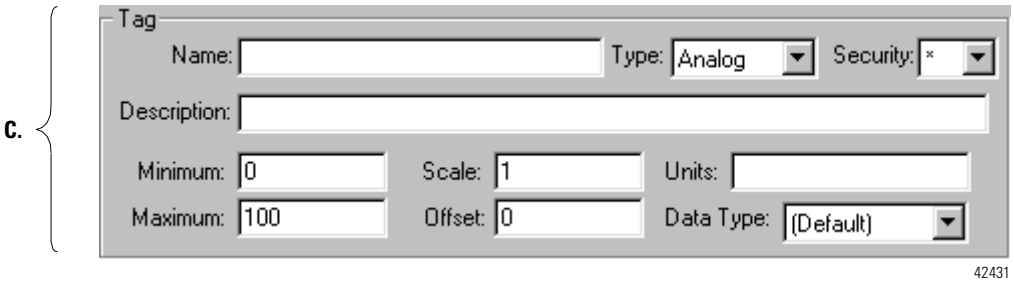
Create a Polled Tag

To create RSView tags one tag at a time:

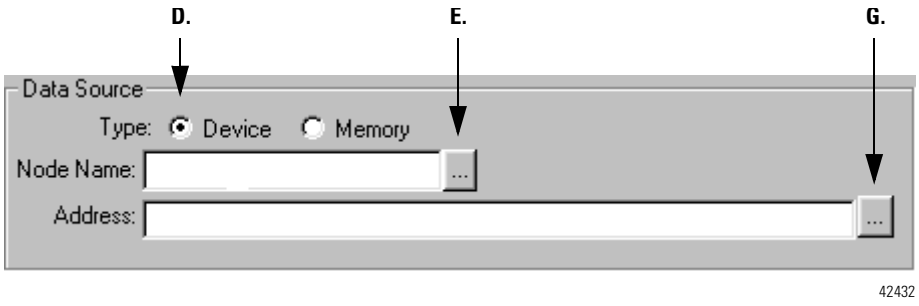


A. Double-click *Tag Database*.

B. Click *New*.



C. Specify the properties of the tag.



D. Click *Device*.

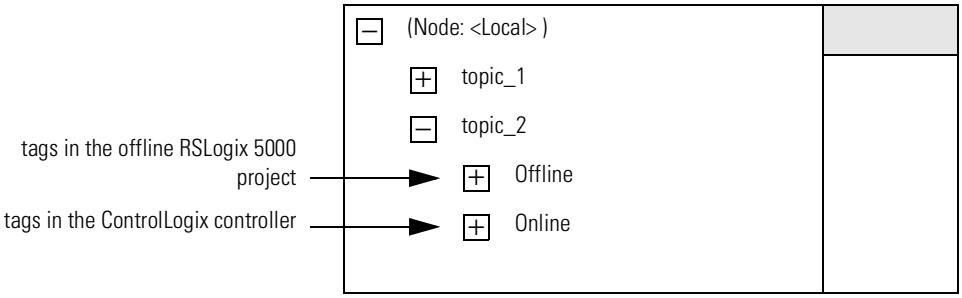
E. Click ....

F. Select the name of the node that you created in "Create a Polled Node" and click *OK*.

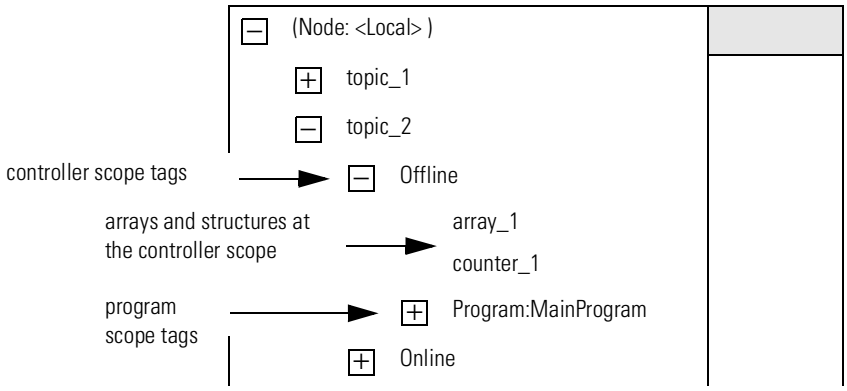
G. Click ....

H. Click the + sign.

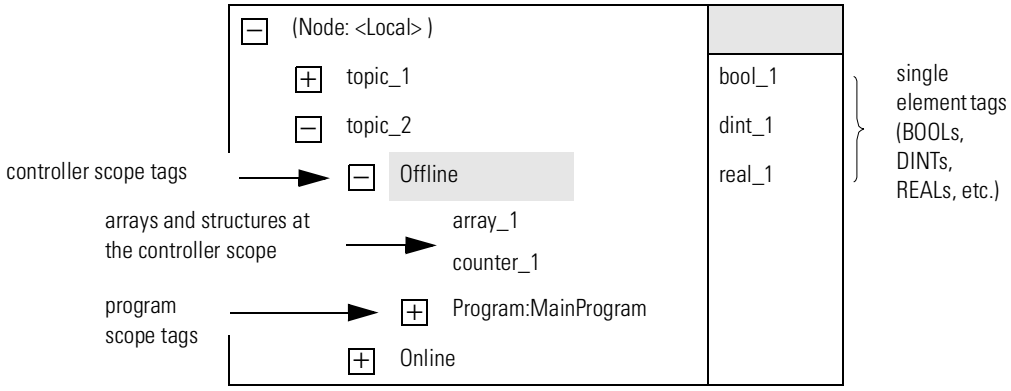
I. Next to the topic from "Create a Polled Topic," click the + sign.



J. Next to *Offline*, click the + sign.



K. On the left, select the entry that contains the required tag (address).



L. On the right, double-click the tag that contains the required data (i.e., the address for the RSView tag).

M. Click *Accept*.

N. If this is an RSView32 project, go to Validate an RSView32 Tag.

Create a Unsolicited Topic

A. Display RSLinx software.

B. From the *Communications* menu, select *Configure Client Applications*.

C. Click the *Virtual Link ID* tab.

D. Do you want to use the same Virtual Link ID for each workstation in your system? (Node or IP addresses are sufficient to distinguish between workstations.)

If:	Then:
Yes	1. Record the Virtual Link ID number, which you will use in subsequent steps. 2. Click *OK*.
No	1. Enter a unique Virtual Link ID for the workstation. 2. Click *OK*. 3. Close the RSLinx software. (If you configured RSLinx software to start as a service, you must also stop the service.) 4. Re-open the RSLinx software.

E. From the *DDE/OPC* menu, select *Topic Configuration …*

F. In the bottom left corner of the window, click *New*.

G. Type a name for the topic and press the *Enter* key.

H. Click the *Data Collection* tab.

I. Specify the following parameters:

For this item:	Do this:
Processor Type	Select *PLC-5*.
Data Collection Mode	1. Clear the *Polled Messages* check box. 2. Select the *Unsolicited Messages* check box.

J. Click the *Advanced Communication* tab.

K. Specify the following parameters:

For this item:	Type or select:
Communication Driver	driver for the network across which you will send the message
Station	slot number of the controller that is sending the message
Local or Remote Addressing	*Remote*

L. In the *Remote Routing Configuration* dialog box, specify the following parameters:

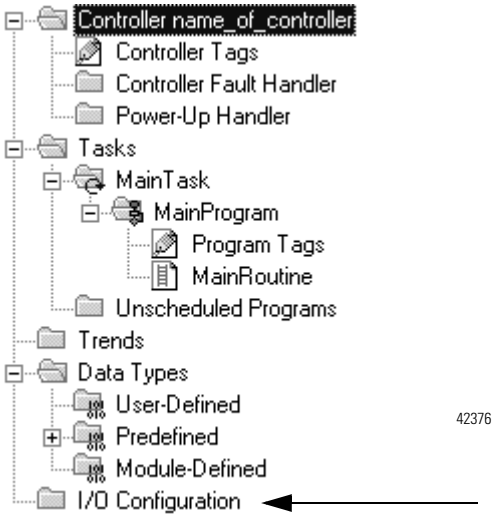
For this parameter:	Type or select:
Bridge Device	*1785-KA5 Bridge/5130-KA*
Local ID	Virtual Link ID from Step D.
Local KA5	arbitrary number between 1 and 107 (RSLinx requires an entry but this configuration does *not* use the entry.)
Remote ID	number that designates the backplane of the ControlLogix chassis (Use a different number for each backplane.)

M. Click *OK*.

N. Click *Done* and confirm the update of the topic.

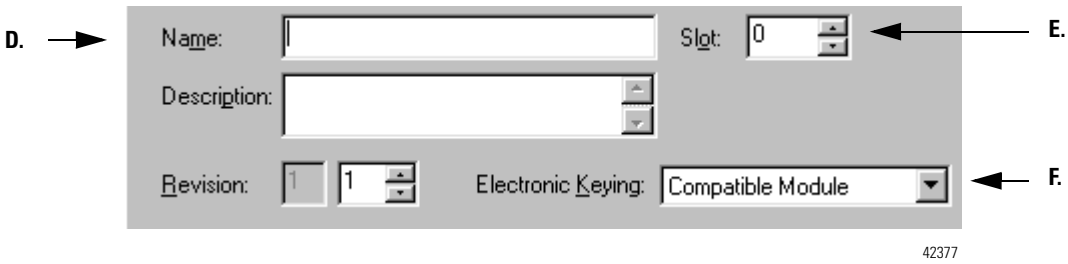
Add the 1756-CNB Module

A. Open the RSLogix 5000™ project offline.



B. Right-click *I/O Configuration* and select *New Module*.

C. Select your type of CNB and click *OK*.



D. Type a name for the module (i.e., `name_of_local_cnb`).

E. Type or select the slot number where the module is installed

F. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.

H. Initially, do you want to the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE

Inhibit a module

Use the Inhibit Module check box to make it easier to test a system:

- Initially, inhibit the module.
- When you are ready to test the devices that are associated with the module, clear the check box.

I. If communication with the module fails, how do you want the controller to respond?

ATTENTION

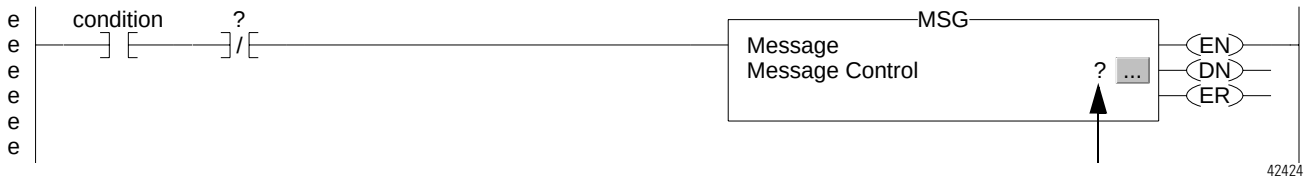
If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

J. Click *Finish*.

Enter a Message

A. Enter a MSG instruction and associated input instruction (s).



B. In the MSG instruction, type a name for the message control tag and press the *Enter* key.

C. In the MSG instruction, right-click the message control tag and select *New* `tag_name.` (In older revisions of the software, the menu option is *Create* `tag_name.`)

D. From the *Scope* list, select `name_of_controller`*(controller)*, and click *OK*.

E. Enter `message.`EN.

where:

`message` is the message control tag from step B.

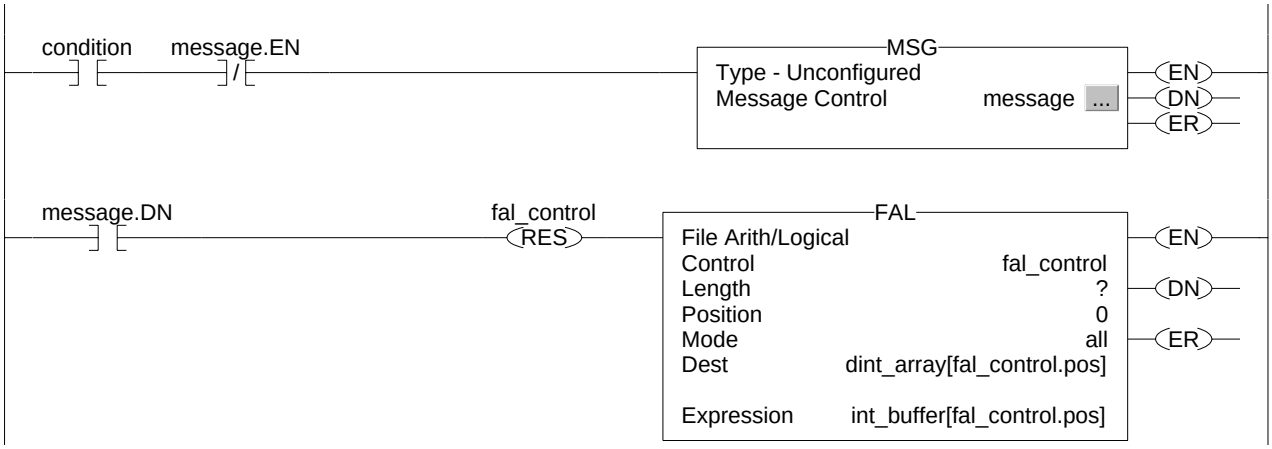
F. If your message reads or writes integers (not REALs), use a buffer of INTs in the message.

- ControlLogix controllers execute more efficiently and use less memory when working with 32-bit integers (DINTs). Use the DINT data type for integers whenever possible.
- In this procedure, you use a PLC-5 Typed Read or PLC-5 Typed Write message, which requires 16-bit integers.
- Use an INT buffer in the message and move the data into or out of the buffer as required.

The following examples show how to use a buffer of INTs

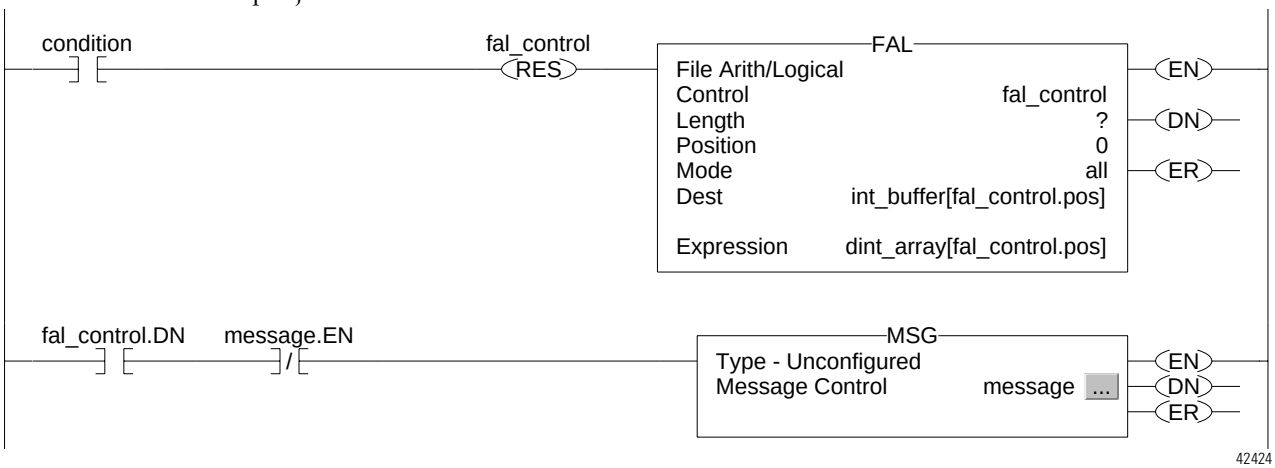
EXAMPLE Read integers from an RSView project

When *condition* turns on, reads 16-bit integer values (INTs) and stores them in *int_buffer*. Then the FAL instruction moves the values to *dint_array*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the ControlLogix controller.



EXAMPLE Write integers to an RSView project

When *condition* turns on, moves the values in *dint_array* to *int_buffer*. This converts the values to 16-bit integers (INTs). Then the message instruction sends *int_buffer* to the RSView project.



Where:	Is an:
dint_array	array of DINTs that are used in the ControlLogix controller
int_buffer	array of INTs with the same number of elements as *dint_array*

Configure the Message

A. In the MSG instruction, click ....

B. On the Configuration tab, specify the following parameters:

Table 14.1 Message to a RSView project

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	logical address, such as N7:0
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	logical address, such as N7:0
floating-point (REAL)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	logical address, such as F8:0
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	logical address, such as F8:0

C. Click the *Communication* tab.

D. Click *Browse …*

E. Select the 1756-CNB module and click *OK*.

F. In the *Path* text box, add:

, 2, `address`, 1, 0

where:

`address` is the ControlNet node number of the workstation.

EXAMPLE Complete path entry

washer_chassis, 2, 5, 1, 0

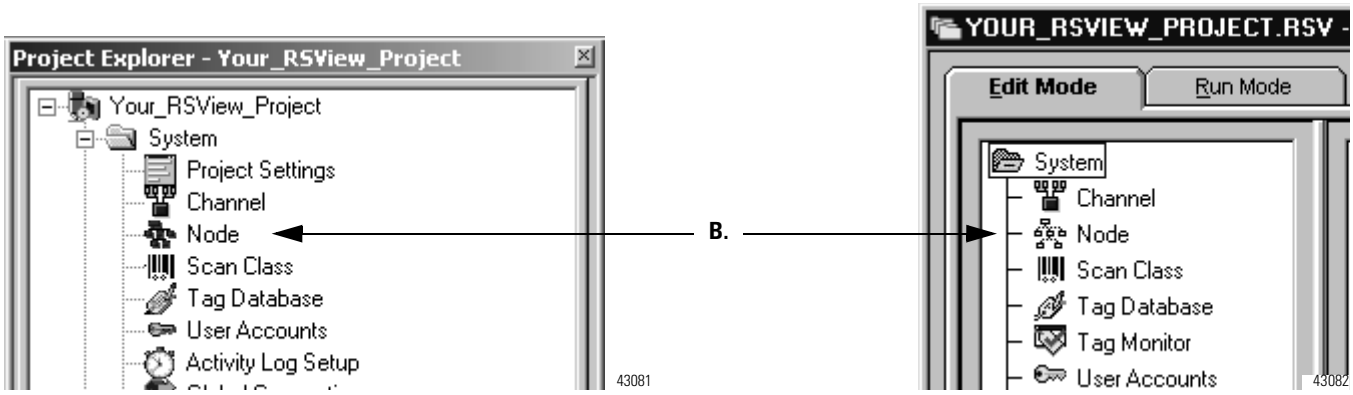
G. On the *Communication* tab, specify the following parameters:

For this item:	Type or select:
Communication Method	*CIP With Source ID*
Source Link	Remote ID from "Create a Unsolicited Topic, step L."
Destination Link	Virtual Link ID from "Create a Unsolicited Topic, step D."
Destination Node	77 (RSLinx reserves node 77 for DDE topics.)

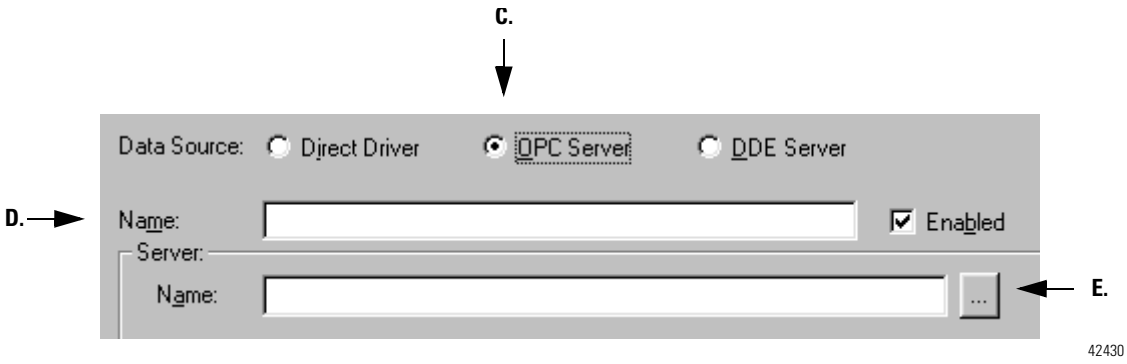
H. Click *OK*.

Create an Unsolicited Node

A. Open the RSView project.



B. Double-click *Node*.



C. Click *OPC Server*.

D. Type a name for the node.

E. Click ....

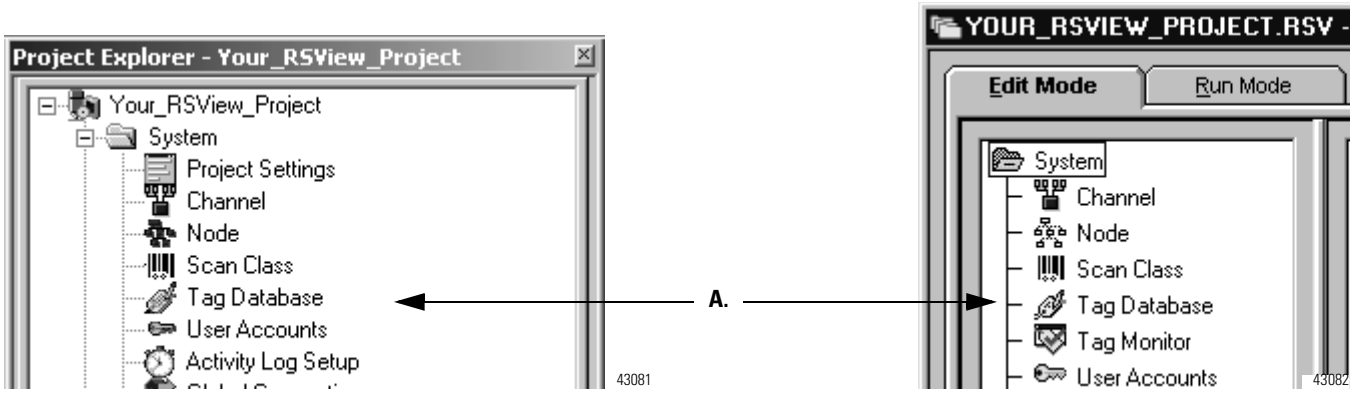
F. Select *RSLinx OPC Server* and click *OK*.

G. In the *Access Path* box, type the name of the topic from "Create a Unsolicited Topic."

H. Click *Accept*.

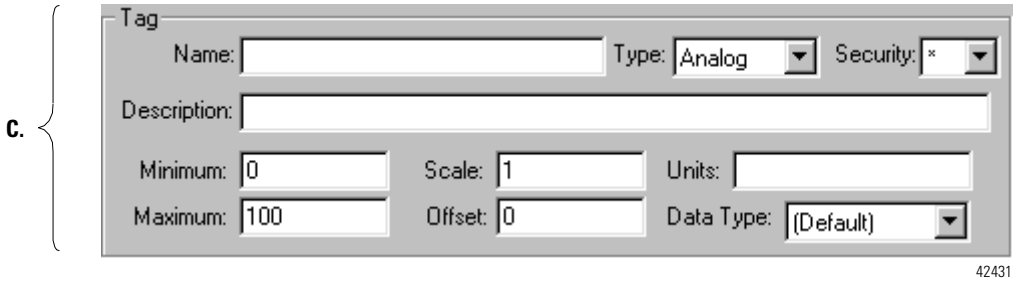
I. Click *Close*.

Create an Unsolicited Tag

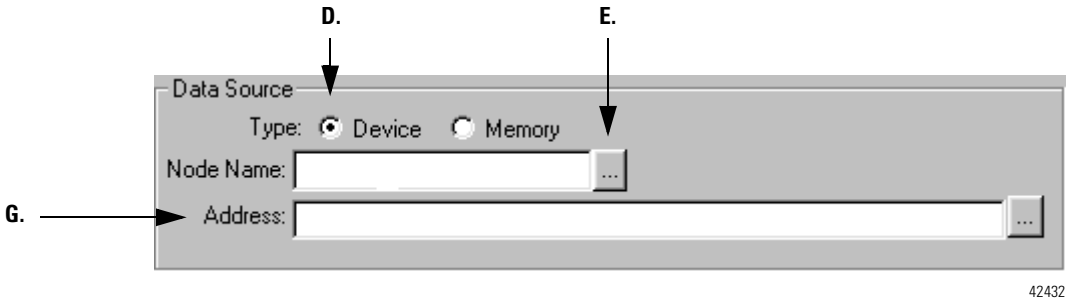


A. Double-click *Tag Database*.

B. Click *New*.



C. Specify the properties of the tag.



D. Click *Device*.

E. Click ....

F. Select the name of the node that you created in "Create an Unsolicited Node" and click *OK*.

G. Type the address for the tag:

If the controller:	Then type the:
writes the value	destination address that you specified in the MSG instruction
reads the value	source address that you specified in the MSG instruction

H. Click *Accept*.

Validate an RSView32 Tag

This procedure applies only to RSView32 projects.

A. On the *Edit Mode* tab, double-click *Tag Monitor*.

Tag Name	Value	State

B. Type the name of the RSView tag and press the *Enter* key.

Tag Name	Value	State
tag_name		

C. What does the *State* column display?

If:	Then:
valid	The tag contains a valid value from the controller.
error	There is a communication problem, such as the: • controller is not available • server is not running If a MSG instruction reads or writes the value, you will see *error* until the controller sends the message for the first time.

Monitor Connections

When To Use This Procedure

Use this procedure to alert the system to the loss of communication with a device (module) in the I/O configuration of the controller. For example:

- failure of a module
- loss of power to a chassis
- failure of a communication module
- break in a cable

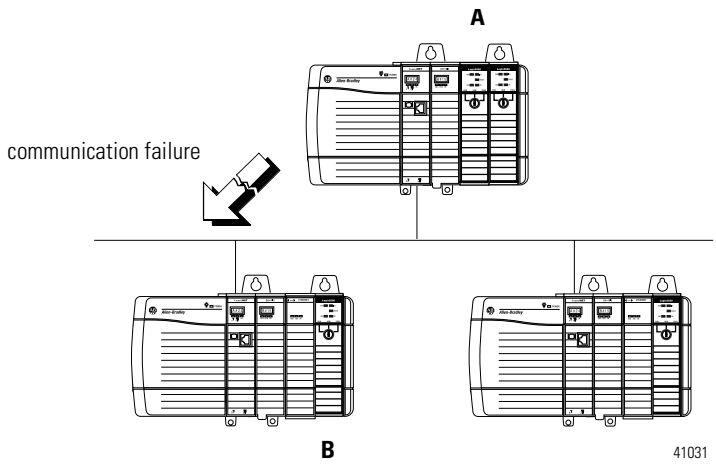
If the controller losses communication with a module:

- Data from that device does not update.
- The logic makes decisions on data that may or may not be correct.

EXAMPLE

Loss of communication

Controller B requires data from controller A. If communication fails between the controllers, then controller B continues to act on the last data that it received from controller A.

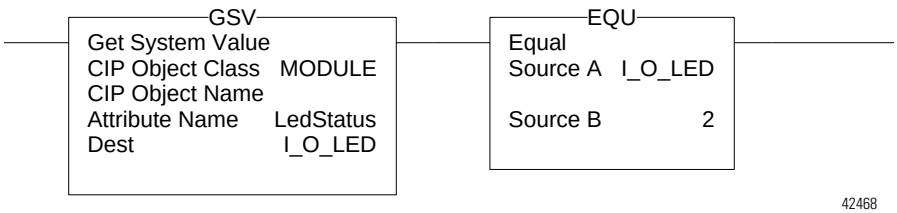


Monitor a Connection

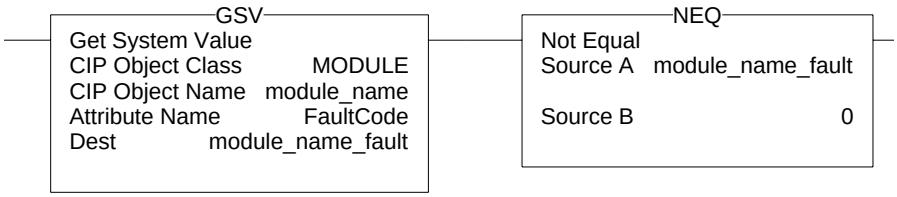
If communication with a device in the I/O configuration of the controller does not occur for 100 ms, the communication times out and the controller produces the following warnings:

- The I/O LED on the front of the controller flashes green.
- A ⚠ shows over the I/O configuration folder and over the device (s) that has timed out.
- A module fault code is produced, which you can access through:
  - Module Properties dialog box for the module
  - GSV instruction

How do you want to handle the loss of communication with a module in the I/O configuration of the controller?

If you want to:	Then:
determine if communication has timed out with any device	Enter the following rung and add the specific action to occur: If communication times out with at least one device (module) in the I/O configuration of the controller, the I/O LED on the front of the controller flashes green. • The GSV instruction gets the status of the I/O LED and stores it in the *I_O_LED* tag. • If *I_O_LED* equal 2, the controller has lost communication with at least one device.  where: *I_O_LED* is a DINT tag that stores the status of the I/O LED on the front of the controller.

If you want to:	Then:
determine if communication has timed out with a specific device	Enter the following rung for the device and add the specific action to occur: If communication times out with a device (module) in the I/O configuration of the controller, the controller produces a fault code for the module. • The GSV instruction gets the fault code for *module_name* and stores it in the *module_name_fault* tag. • If *module_name_fault* is not equal to 0, then the controller is not communicating with the module.



Where:	Is a:
module_name	name of the module from the I/O configuration
module_name_fault	DINT tag that stores the fault code for the module

interrupt the execution of logic and execute the Controller Fault Handler	A. In the controller organizer, right-click the module and select *Properties*. B. Click the *Connection* tab. C. Select (check) the *Major Fault If Connection Fails While in Run Mode* check box. D. Develop a routine for the Controller Fault Handler. See the *Logix5000 Controllers Common Procedures*, publication 1756-PM001.

Notes:

Communicate with a DeviceNet Device

When to Use This Procedure

Use this procedure to monitor and control I/O devices that are part of a DeviceNet network. Before you use this procedure, set up the DeviceNet network:

- Connect the devices to the network.
- In RSNetWorx for DeviceNet software, complete these actions:
  - Assign a node address to each device.
  - Configure each device.
  - Add the devices to the scan list of the 1756-DNB module.

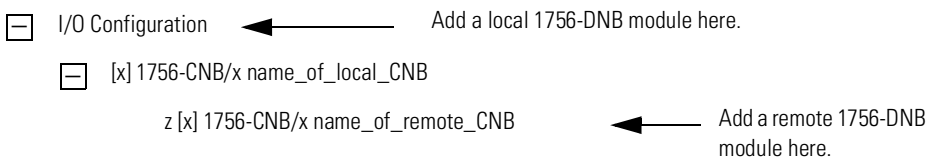
How to Use This Procedure

To complete this procedure, do the following steps:

- Step 1: Add the 1756-DNB Module
- Step 2: Create Aliases
- Step 3: Set the Scanner to Run Mode

Step 1: Add the 1756-DNB Module

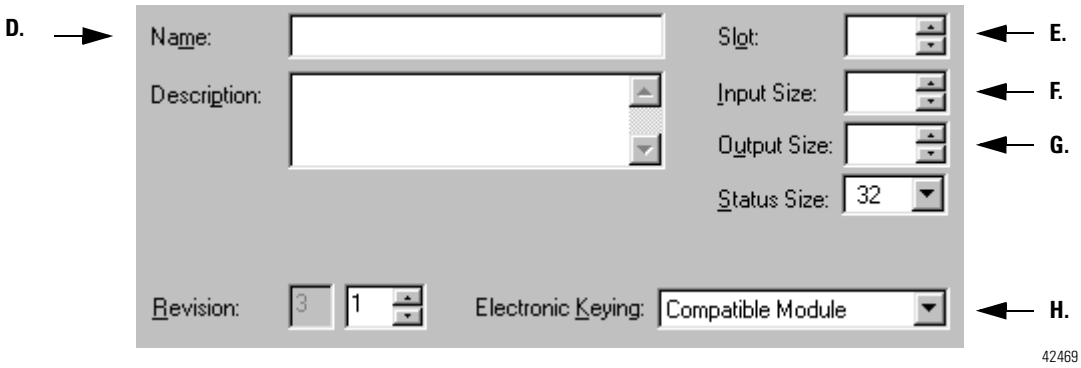
A. Open the RSLogix 5000 project.


I/O Configuration
Add a local 1756-DNB module here.
[x] 1756-CNB/x name_of_local_CNB
z [x] 1756-CNB/x name_of_remote_CNB
Add a remote 1756-DNB module here.

B. Where is the 1756-DNB module located?

If it is in:	Then:
same chassis as controller	right-click *I/O Configuration* and select *New Module*.
remote chassis	right-click the remote 1756-CNB module and select *New Module*.

C. Select *1756-DNB* and click *OK*.



D. Type a name for the module. Use a name that identifies the I/O of the network.

E. Type or select the slot number of the module.

F. Type or select the number of input words that are mapped in the scanner plus 1.

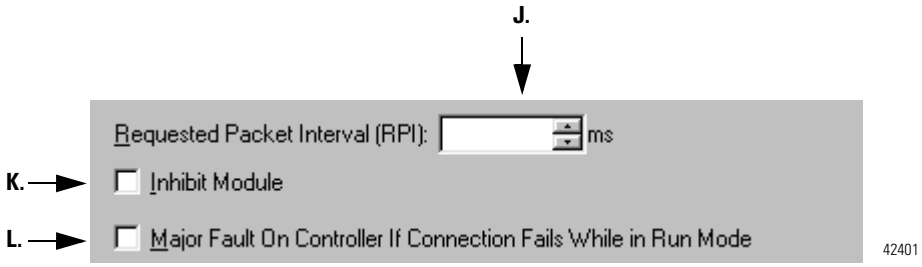
For example, if inputs are mapped from word 0 to word 4 (5 words), enter a value of 6 (5 input words + 1 = 6).

G. Type or select the number of output words that are mapped in the scanner plus 1.

H. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

I. Click *Next*.



J. Is the module in a remote chassis?

If:	Then:
Yes	Type the rate at which the fastest device in the chassis must update. • Use a power of two times the ControlNet NUT. • For example, if the NUT is 5 ms, type a rate of 5, 10, 20 ms, etc.
No	Leave the RPI at the default setting.

K. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

L. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

M. Click *Finish*.

Step 2: Create Aliases

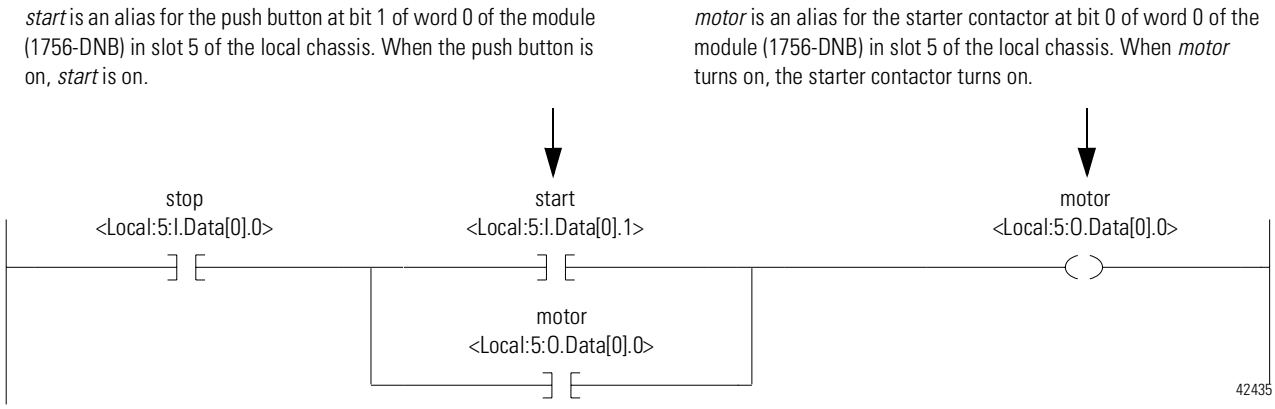
In this step, you convert tags in your programs to aliases for I/O points (devices). As an alias for an I/O point, each tag:

- provides a descriptive name for the device that is wired to the point
- represents the value of the point. When one changes, the other reflects the change.

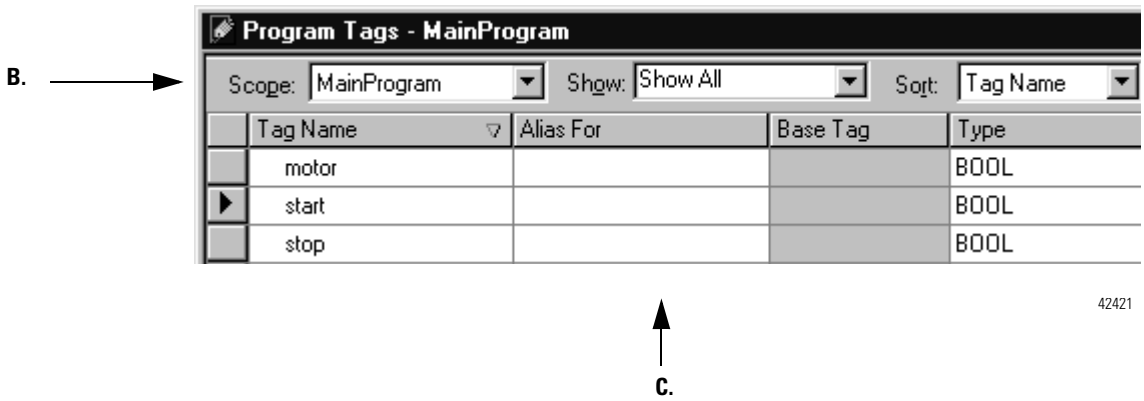
EXAMPLE

Create aliases

The following logic was initially programmed using descriptive tag names, such as *start* and *motor*. Later, the tags were converted to aliases for the corresponding I/O devices.



A. From the *Logic* menu, select *Edit Tags*.



B. Select the scope of the descriptive tag.

C. To the right of the tag name, click the *Alias For* cell.

The cell displays a ▼

D. Click the ▼

E. Click the *Controller Scoped Tags* button, if it is available. (All the data for I/O modules is at the controller scope.)

F. Next to *name:slot:X,* click the + sign.

Where:	**Is:**	
name	name of the chassis:	
	If:	**Then the name is:**
	local	Local
	remote	name of the 1756-CNB module in the chassis
slot	slot number of the module	
X	type of device:	
	If:	**Then:**
	input	*I*
	output	*O*

G. Next to *name:slot:X.Data*, click the + sign.

H. Click *name:slot:X.Data[y].*

where:

y is the group number that the device is wired to.

I. To the right of the selection, click ▼

J. Click the bit number of the device.

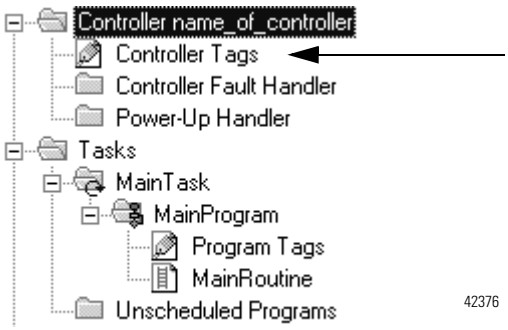
K. Press the *Enter* key or click another cell.

When you finish, the Tags window should look similar to this:

Tag Name	Alias For	Base Tag
start	Local:5:I.Data[0].1(C)	Local:5:I.Data[0].1(C)

start is an alias for bit 1 of word 0 of slot 5 in the local chassis.

Step 3: Set the Scanner to Run Mode



A. Double-click *Controller Tags*.

Tag Name	Value
⊞ name:slot:0	(. . .)

B. Next to *name:slot : 0*, click the + sign.

Where:	Is:	
name	name of the chassis:	
	If:	**Then the name is:**
	local	Local
	remote	name of the 1756-CNB module in the chassis
slot	slot number of the module	

Tag Name	Value
⊟ name:slot:0	(. . .)
⊞ name:slot:0.CommandRegister	(. . .)

C. Next to *name:slot : 0.CommandRegister*, click the + sign.

Tag Name	Value
⊟ name:slot:0	{ . . . }
⊟ name:slot:0.CommandRegister	{ . . . }
name:slot:0.CommandRegister.Run	0

D. In *name:slot : 0.CommandRegister*, enter a 1.

Tag Name	Value
⊟ name:slot:0	{ . . . }
⊟ name:slot:0.CommandRegister	{ . . . }
name:slot:0.CommandRegister.Run	1

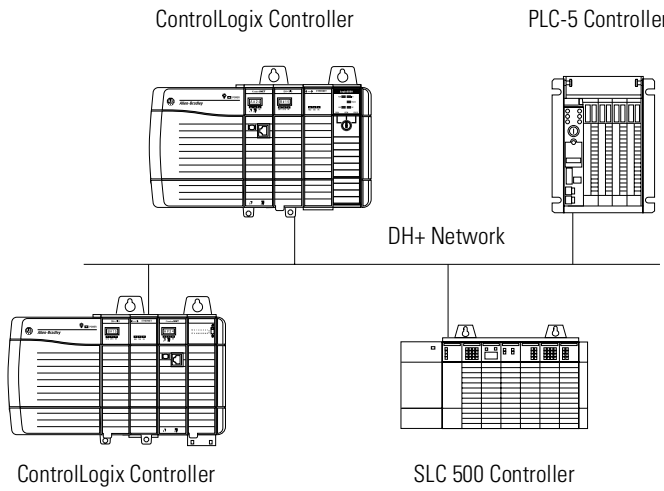
Notes:

Communicate with Another Controller Over a DH+™ Network

When to Use This Procedure

Use this procedure to send a message over a DH+ network between:

- ControlLogix controllers
- ControlLogix controller and a PLC-5® or SLC 500™ controller



How to Use This Procedure

If you have not already done so in a previous procedure, do the following preliminary steps:

- Configure Routing Tables
- Configure a 1756-DHRIO Channel

To complete this procedure, do the following steps:

- Add a 1756-DHRIO Module
- Enter a Message
- Configure the Message
- Stagger the Messages

If a PLC-5 or an SLC 5/05 controller sends the message, do the following step:

- Access ControlLogix Data

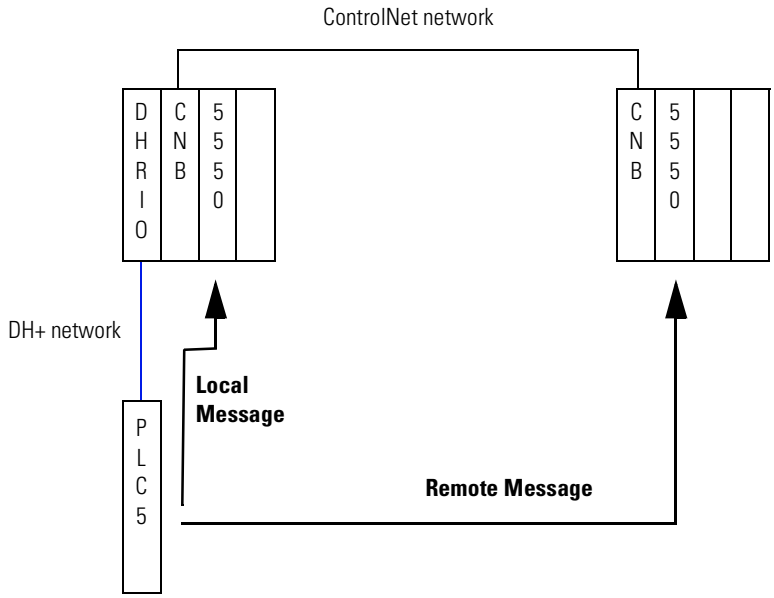
Configure Routing Tables

Determine if you must complete this task:

If a:	Sends a message to a:	Over a:	And there is:	Then:
PLC-5 controller SLC 500 controller	ControlLogix controller	local network	only one ControlLogix controller in the chassis	Go to "Configure a 1756-DHRIO Channel" on page 17-8.
			more than one ControlLogix controller in the chassis	Complete this task.
		remote network	→	Complete this task.
ControlLogix controller	PLC-5 controller SLC 500 controller	local network	→	Go to "Add a 1756-DHRIO Module" on page 17-11.
		remote network	→	Complete this task.
	ControlLogix controller	→	→	Go to "Add a 1756-DHRIO Module" on page 17-11.

The following example shows a local message and a remote message from a PLC-5 controller. Any type of network can link the ControlLogix chassis.

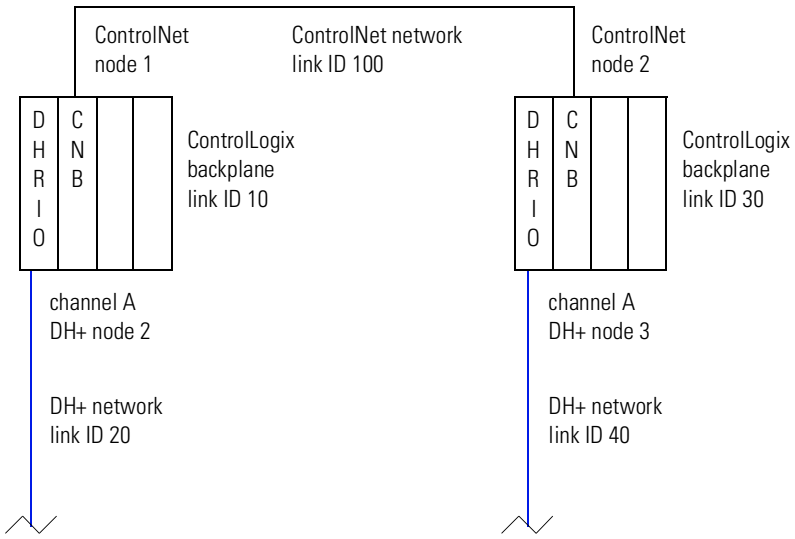
EXAMPLE Local and remote messages



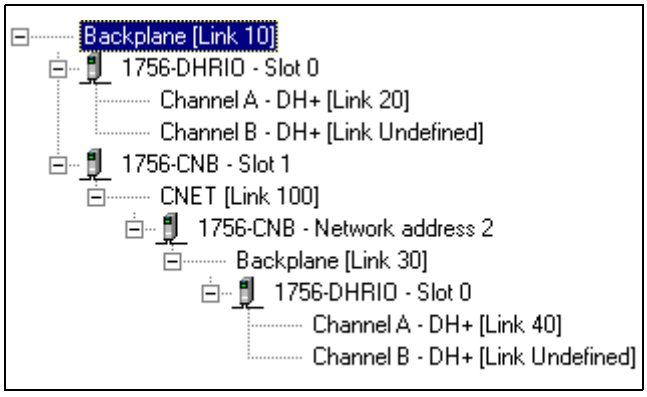
In this task, you configure routing tables for 1756-DHRIO modules. The modules use the routing tables to send the message to the destination.

In the following example, two ControlLogix chassis link different DH+ networks together via a ControlNet network.

EXAMPLE Routing table



Routing table for the left 1756-DHRIO module


Backplane [Link 10]
1756-DHRIO - Slot 0
Channel A - DH+ [Link 20]
Channel B - DH+ [Link Undefined]
1756-CNB - Slot 1
CNET [Link 100]
1756-CNB - Network address 2
Backplane [Link 30]
1756-DHRIO - Slot 0
Channel A - DH+ [Link 40]
Channel B - DH+ [Link Undefined]

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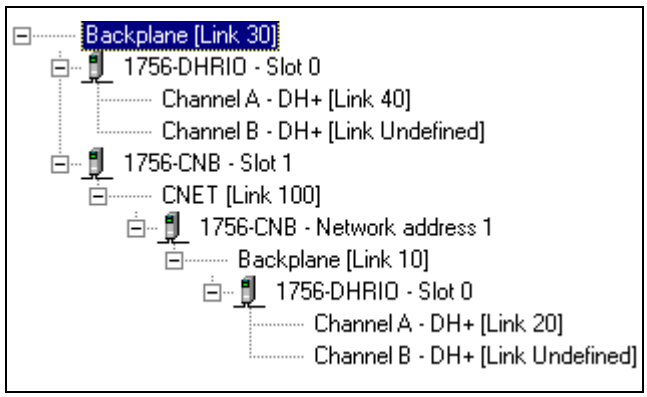
Routing table for the right 1756-DHRIO module


Backplane [Link 30]
1756-DHRIO - Slot 0
Channel A - DH+ [Link 40]
Channel B - DH+ [Link Undefined]
1756-CNB - Slot 1
CNET [Link 100]
1756-CNB - Network address 1
Backplane [Link 10]
1756-DHRIO - Slot 0
Channel A - DH+ [Link 20]
Channel B - DH+ [Link Undefined]

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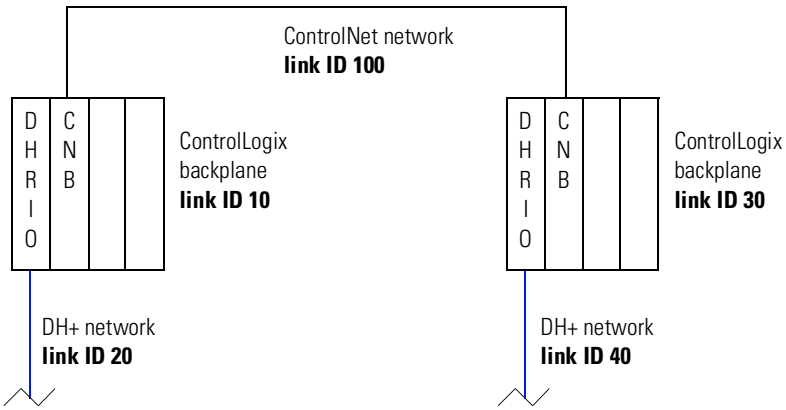
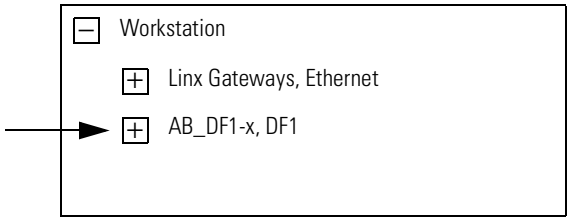
Configure a routing table for each 1756-DHRIO module that is along the route or path to the other controller:

Step:	Detailed actions:
A. For each network and each ControlLogix backplane in your system, designate a unique link ID number.	Here is an example: 
B. Connect the hardware.	1. Install the 1756-DHRIO module. 2. Connect the chassis to a network that you can access from your workstation. For example, perform one of the following: • Connect a serial cable to your workstation and a ControlLogix controller that is in the same chassis as the 1756-DHRIO module. • Connect each chassis to an EtherNet/IP, ControlNet, or DH+ network. 3. Power-up each chassis.

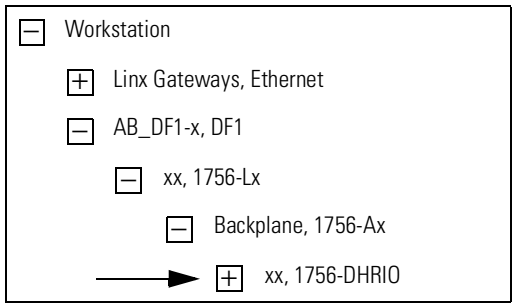
Step:	Detailed actions:
C. Display the routing table.	1. Start RSLinx software.

To expand a network one level, do one of the following:

- Double-click the network.
- Select the network and press the → key.
- Click the + sign.



2. Expand the network from step B. until you see the 1756-DHRIO module.



3. Right-click the DHRIO module and choose *Module Configuration*.
4. Click the *DHRIO Routing Table* tab.

D. Define the link ID of the backplane in which the 1756-DHRIO module resides.	1. At the top of the routing table, right-click the backplane link and choose *Edit Module …* 2. Type the link ID of the backplane and choose *OK*.
E. Define the link IDs of the 1756-DHRIO module.	1. Right-click the 1756-DHRIO module and choose *Edit Module …* 2. For each channel, type the link ID of the corresponding network. 3. Choose *OK*.
F. Add the remaining communication module (s) that are in the backplane (chassis).	1. Right-click the backplane and choose *Add Module …* 2. Select the type of device and choose *OK*. 3. Type or select the slot number of the module. 4. Type the link ID(s) of the network(s) to which the module is connected. 5. Choose *OK*.

<table>
<tr><th>Step:</th><th>Detailed actions:</th></tr>
<tr><td>G. To the network (s) created in the previous step, add the corresponding communication modules in other ControlLogix chassis:</td><td>1. Right-click the link ID and choose Add Module …
2. Select the type of device and choose OK.
3. Type the node or IP address of the module.
4. Type the link ID(s):
<table><tr><th>For this module:</th><th>Type the link ID(s):</th></tr><tr><td>1756-ENET</td><td rowspan="2">of the backplane of the module (i.e., the ControlLogix chassis in which the module resides)</td></tr><tr><td>1756-CNB</td></tr><tr><td>DH+ Bridge</td><td>in the routine table of the added module</td></tr></table>5. Choose OK.</td></tr>
<tr><td>H. Repeat steps F. and G. until the routing table depicts the required networks.</td><td></td></tr>
<tr><td>I. Download and save the configuration.</td><td>1. To download the configuration to the module, choose Apply.
2. To save a copy of the configuration as a file, choose the Save to File button.</td></tr>
</table>

Configure a 1756-DHRIO Channel

Determine if you must complete this task:

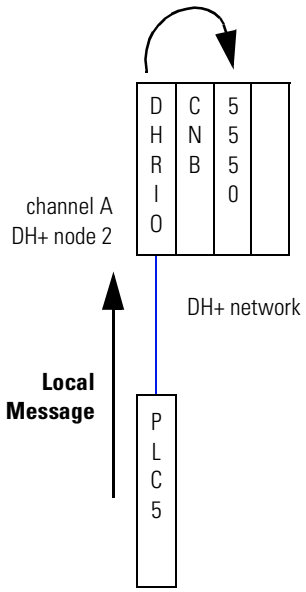
If a:	Sends a message to a:	Over a:	And there is:	Then:
PLC-5 controller SLC 500 controller	ControlLogix controller	local network	only one ControlLogix controller in the chassis	Complete this task.
			more than one ControlLogix controller in the chassis	Go to "Access ControlLogix Data" on page 17-20.
		remote network	→	Go to "Access ControlLogix Data" on page 17-20.
ControlLogix controller	→	→	→	Go to "Add a 1756-DHRIO Module" on page 17-11.

In the following example, a 1756-DHRIO module automatically sends messages to a controller.

EXAMPLE

Route a local message

The 1756-DHRIO module automatically routes any local messages that it receives over Channel A to the controller that is in slot 2.



A. Install the 1756-DHRIO module.

B. Connect the chassis to a network that you can access from your workstation.

For example, perform one of the following:

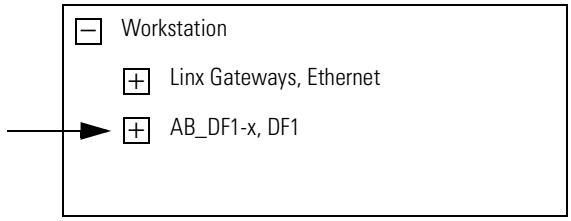
- Connect a serial cable to your workstation and a ControlLogix controller that is in the same chassis as the 1756-DHRIO module.
- Connect the chassis to an EtherNet/IP or ControlNet network.

C. Power-up the chassis.

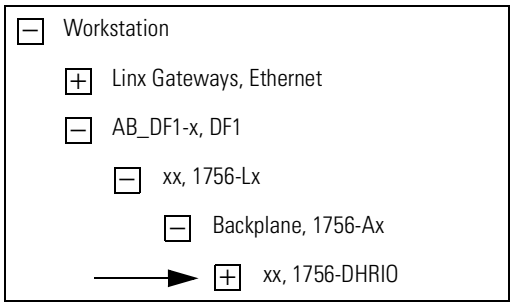
D. Start RSLinx software.

To expand a network one level, do one of the following:

- Double-click the network.
- Select the network and press the → key.
- Click the + sign.

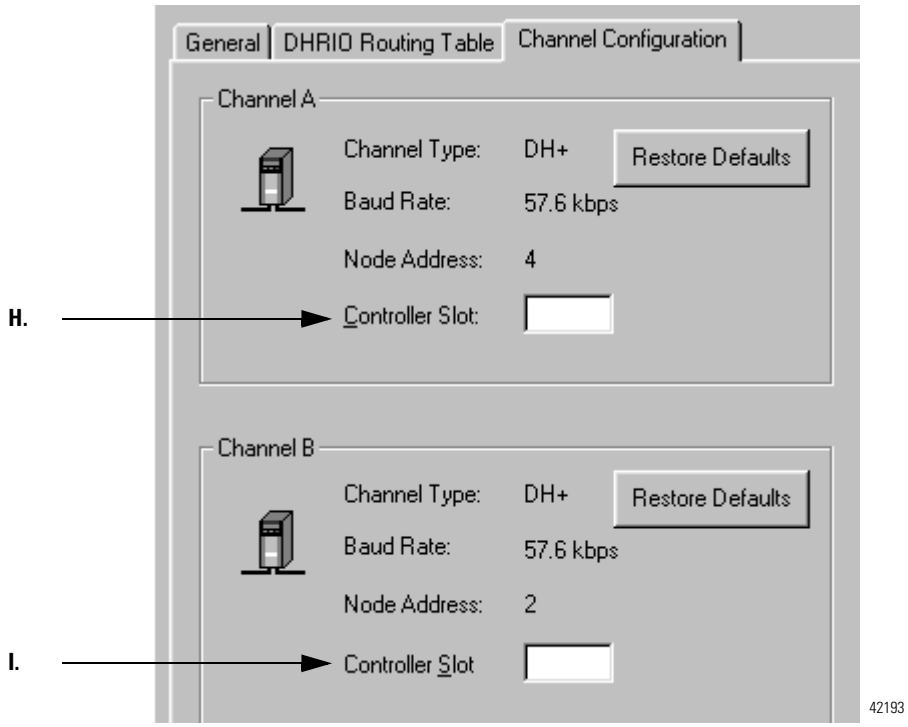


E. Expand the network from step B. until you see the 1756-DHRIO module.



F. Right-click the DHRIO module and choose *Module Configuration*.

G. Click the *Channel Configuration* tab.



H. If Channel A is configured for DH+, type the slot number of the controller that you want to receive local messages over this channel.

I. If Channel B is configured for DH+, type the slot number of the controller that you want to receive local messages over this channel.

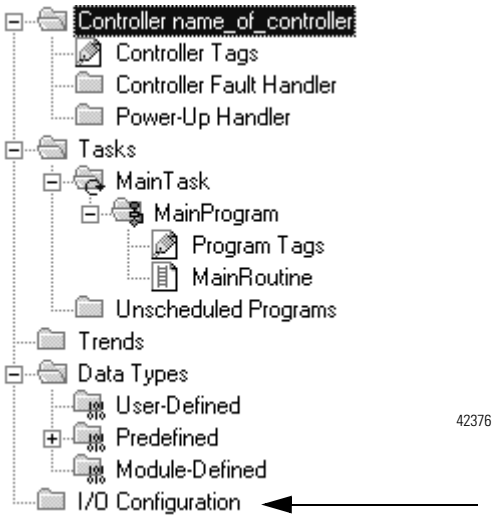
J. To download the configuration to the module, choose *OK*.

Add a 1756-DHRIO Module

Determine if you must complete this task:

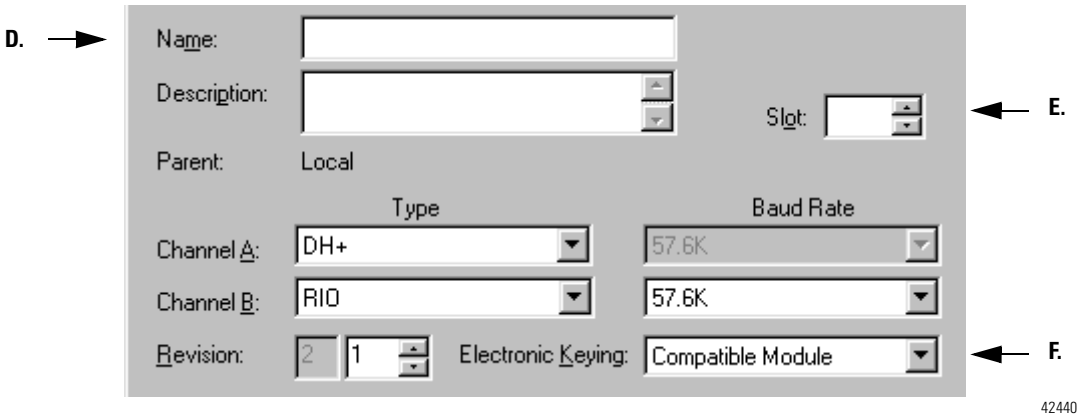
If a:	Then:
ControlLogix controller sends the message	Complete this task.
PLC-5 or SLC 500 controller sends the message	Go to "Access ControlLogix Data" on page 17-20.

A. Open the RSLogix 5000™ project offline.



B. Right-click *I/O Configuration* and select *New Module*.

C. Select your series of 1756-DHRIO module and click *OK*.



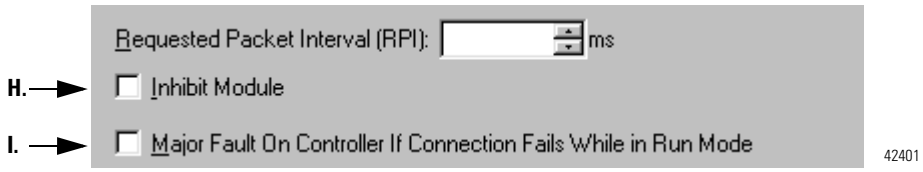
D. Type a name for the module (i.e., *name_of_DHRIO*).

E. Type or select the slot number where the module is installed

F. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

G. Click *Next*.



H. Initially, do you want the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE Inhibit a module

Use the Inhibit Module check box to make it easier to test a system:

- Initially, inhibit the module.
- When you are ready to test the devices that are associated with the module, clear the check box.

I. If communication with the module fails, how do you want the controller to respond?

ATTENTION

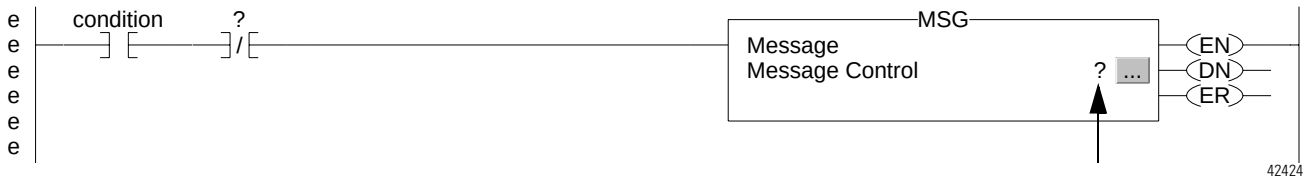
If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

J. Click *Finish*.

Enter a Message

A. Enter a MSG instruction and associated input instruction (s).



B. In the MSG instruction, type a name for the message control tag and press the *Enter* key.

C. In the MSG instruction, right-click the message control tag and select *New* `tag_name.` (In older revisions of the software, the menu option is *Create* `tag_name.`)

D. From the *Scope* list, select `name_of_controller`*(controller)*, and click *OK*.

E. Enter `message.`EN.

where:

`message` is the message control tag from step B.

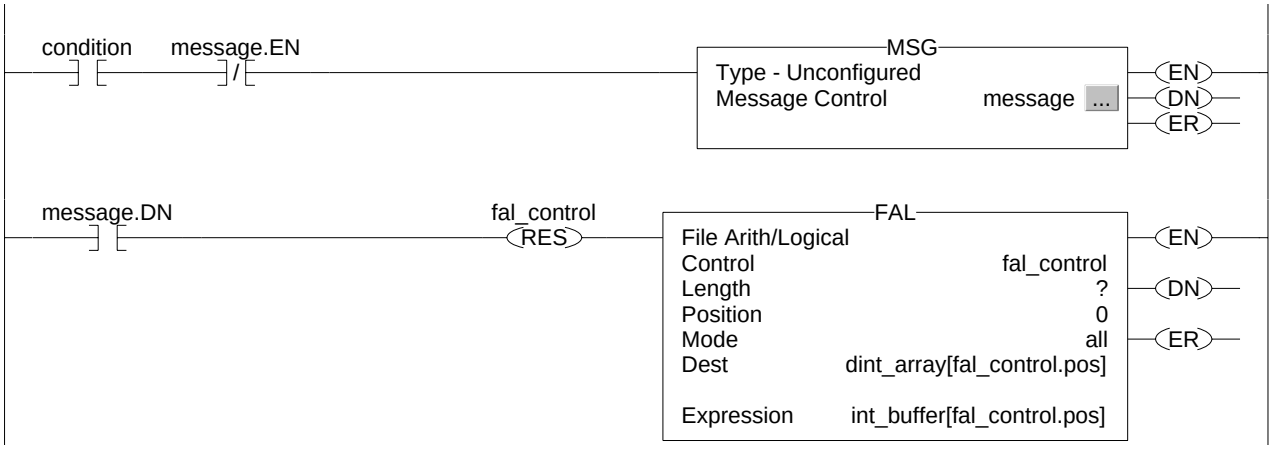
F. If your message is to a PLC-5® or SLC 500™ controller *and* it reads or writes integers (not REALs), use a buffer of INTs in the message.

- ControlLogix controllers execute more efficiently and use less memory when working with 32-bit integers (DINTs). Use the DINT data type for integers whenever possible.
- PLC-5 and SLC 500 controllers require 16-bit integers.
- Use an INT buffer in the message and move the data into or out of the buffer as required.

The following examples show how to use a buffer of INTs

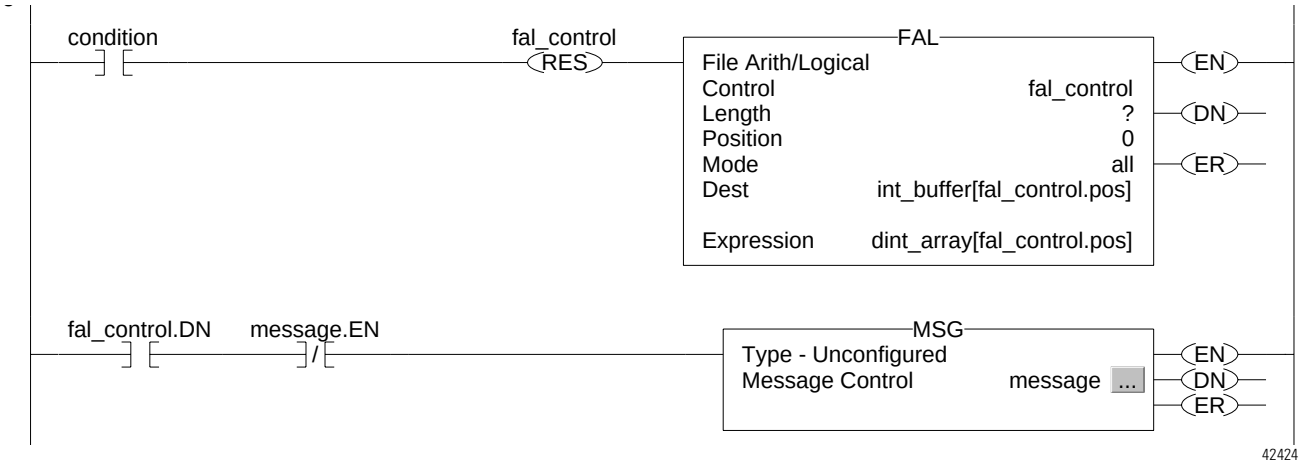
EXAMPLE Read integers from a PLC-5 controller

When *condition* turns on, reads 16-bit integer values (INTs) and stores them in *int_buffer*. Then the FAL instruction moves the values to *dint_array*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the ControlLogix controller.



EXAMPLE Write integers to a PLC-5 controller

When *condition* turns on, moves the values in *dint_array* to *int_buffer*. This converts the values to 16-bit integers (INTs). Then the message instruction sends *int_buffer* to the other controller.



Where:	Is an:
dint_array	array of DINTs that are used in the ControlLogix controller
int_buffer	array of INTs with the same number of elements as *dint_array*

Configure the Message

A. In the MSG instruction, click ... .

B. Select a configuration for the message:

Table 17.A Message to a ControlLogix controller

If you want to:	For this item:	Type or select:
read (receive) the data	Message Type	*CIP Data Table Read*
	Source Element	first element of the tag that contains data in the other controller
	Number Of Elements	number of elements to transfer
	Destination Tag	first element of the tag (controller-scoped) in this controller for the data
write (send) the data	Message Type	*CIP Data Table Write*
	Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
	Number Of Elements	number of elements to transfer
	Destination Element	first element of the tag for the data in the other controller

Table 17.B Message to a SLC 500 controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., F8:0)

Table 17.C Message to a PLC-5 controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., F8:0)

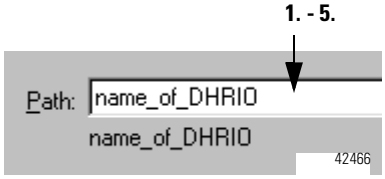
C. Click the *Communication* tab.

D. Click *Browse …*

E. Select the 1756-DHRIO module and click *OK*.

F. Specify the remaining communication properties:

For a message to a:	Type or select:
ControlLogix controller	1. Type a comma [,]. 2. Type the port number from which the message exits:



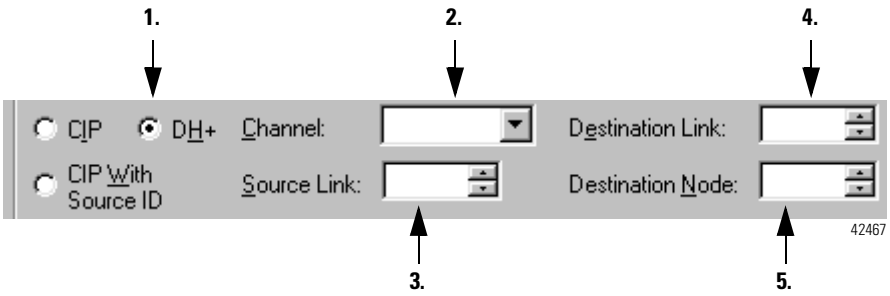
For this port:	Specify:
backplane port of a 1756 controller or module	1
ControlNet port of a 1756-CNB module	2
EtherNet/IP port of a 1756-ENBx or -ENET module	
channel A of a 1756-DHRIO module	
channel B of a 1756-DHRIO module	3

3. Type a comma [,].
4. Type the address of the next hardware device (e.g., controller, module):

For a device on a:	Specify:
ControlLogix backplane	slot number
ControlNet network	node number
EtherNet/IP network	IP address or DNS name
DH+ network	8# followed by the node number (e.g., 8#37)

5. Repeat steps 1. through 4. until you have specified the destination controller.

PLC-5 controller
SLC 500 controller



1. *DH+*
2. channel that is connected to the DH+ network
3. source link:

For a:	Specify:
local message	0 (zero)
remote message	link ID of the ControlLogix backplane (local chassis)

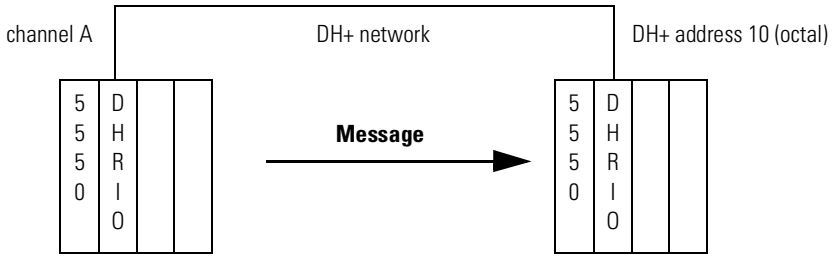
4. destination link:

For a:	Specify:
local message	0 (zero)
remote message	link ID of the destination network

5. in octal, the DH+ node address of the PLC-5or SLC 500 controller

The following examples depicts a communication path over an DH+ network:

EXAMPLE DH+ path



washer, 2, 8#10, 1, 0

where:	indicates:
washer	name of the 1756-DHRIO module
2	channel A of the 1756-DHRIO module
8#10	octal address of the 1756-DHRIO module in the destination chassis
1	backplane port of the 1756-DHRIO module in the destination chassis
0	slot number of the destination controller

G. Select a cache option:

If the message is to a:	Then:
PLC-5 controller	Disregard the *Cache Connection* check box.
SLC 500 controller	
Logix5000 controller: • ControlLogix controller • FlexLogix controller	How many Logix5000 controllers does this controller send messages to?

If:	Then:
16 or less Logix5000 controllers	Leave the *Cache Connection* check box selected (checked).
more than 16 Logix5000 controllers	1. Select16 Logix5000 controllers that require the most frequent messages. 2. Is this message to one of those controllers?

If:	Then
Yes	Leave the *Cache Connection* check box checked.
No	Clear the *Cache Connection* check box.

H. Click *OK*.

Stagger the Messages

As you add messages to your project, you may have to coordinate the execution of the messages. To avoid errors and assure that each message is processed, follow these rules:

Rule 1:	Enable no more than 16 messages at one time (including block transfers).
Rule 2:	Enable no more than 10 of the following types of messages at one time: • CIP data table reads or writes that are *not* cached • CIP generic • PLC2, PLC3, PLC5, or SLC (all types) • block transfer reads or writes that are *not* cached

If the number of messages in your application exceeds rules 1 and 2, then stagger the execution of your messages. Here are some options:

- Send each message in sequence
- Send the messages in groups that are within the limits of rules 1 and 2

Access ControlLogix Data

Complete this task for any message that a PLC-5 or SLC 500 controller sends to a ControlLogix controller over a DH+ network.

If the controllers are on:	And there is:	Then the message is:
same network	only one ControlLogix controller in the chassis	local
	more than one ControlLogix controller in the chassis	remote
different networks	→	remote

IMPORTANT This procedure uses RSLogix 5™ or RSLogix 500™ software, revision 3.x.

A. Using either RSLogix 5 or RSLogix 500 software, as required, open the project for the PLC-5 or SLC 500 controller.

B. If the message is from a SLC 500 controller, in the MSG instruction, specify the following:

For this:	For a:	Select:
Target Device	→	*PLC5*
Local/Remote	local message	*Local*
	remote message	*Remote*

C. Display the set-up screen for the message.

D. Select a set-up:

Table 17.D Set-up for a message from a PLC-5 controller to a ControlLogix controller

For a:	In this item:	Specify:
local message	Communication Command	*PLC-5 Typed Read* or *PLC-5 Typed Write*
	Data Table Address (This PLC-5)	starting address of the data in the PLC-5 controller
	Size in Elements	number of elements to read or write
	Port Number	port through which the message exits
	Data Table Address (Target Device)	Type, in quotation marks [" "], the name of the tag in the ControlLogix controller (e.g., "count").
	Local DH+ Node (Octal)	node number of the 1756-DHRIO module that is in the same chassis as the ControlLogix controller
	Local/Remote	*Local*

Table 17.D Set-up for a message from a PLC-5 controller to a ControlLogix controller (Continued)

For a:	In this item:	Specify:
remote message	Communication Command	*PLC-5 Typed Read* or *PLC-5 Typed Write*
	Data Table Address (This PLC-5)	starting address of the data in the PLC-5 controller
	Size in Elements	number of elements to read or write
	Port Number	port through which the message exits
	Data Table Address (Target Device)	Type, in quotation marks [" "], the name of the tag in the ControlLogix controller (e.g., "count").
	Local DH+ Node (Octal)	node number of the 1756-DHRIO module that is on the same network as the PLC-5 controller
	Local/Remote	*Remote*
	Remote Link Type	*Data Highway*
	Remote Station Address	slot number of the ControlLogix controller, converted to octal
	Remote Bridge Link ID	link ID of the backplane in which the ControlLogix controller resides

Table 17.E Set-up for a message from a SLC 500 controller to a ControlLogix controller

For a:	In this item:	Specify:
local message	Communication Command	*PLC5 Read* or *PLC5 Write*
	Data Table Address (This Controller)	starting address of the data in the SLC 500 controller
	Size in Elements	number of elements to read or write
	Channel	1
	Data Table Address (Target Device)	Type, in quotation marks [" "], the name of the tag in the ControlLogix controller (e.g., "count").
	Local Node Addr (octal)	node number of the 1756-DHRIO module that is in the same chassis as the ControlLogix controller
remote message	Communication Command	*PLC5 Read* or *PLC5 Write*
	Data Table Address (This Controller)	starting address of the data in the SLC 500 controller
	Size in Elements	number of elements to read or write
	Channel	1
	Data Table Address (Target Device)	Type, in quotation marks [" "], the name of the tag in the ControlLogix controller (e.g., "count").
	Local Bridge Addr (octal)	node number of the 1756-DHRIO module that is on the same network as the SLC 500 controller
	Remote Bridge Addr	0
	Remote Station Address	slot number of the ControlLogix controller, converted to octal
	Remote Bridge Link ID	link ID of the backplane in which the ControlLogix controller resides

Route PLC-5® or SLC 500™ Messages From a DH+™ Network

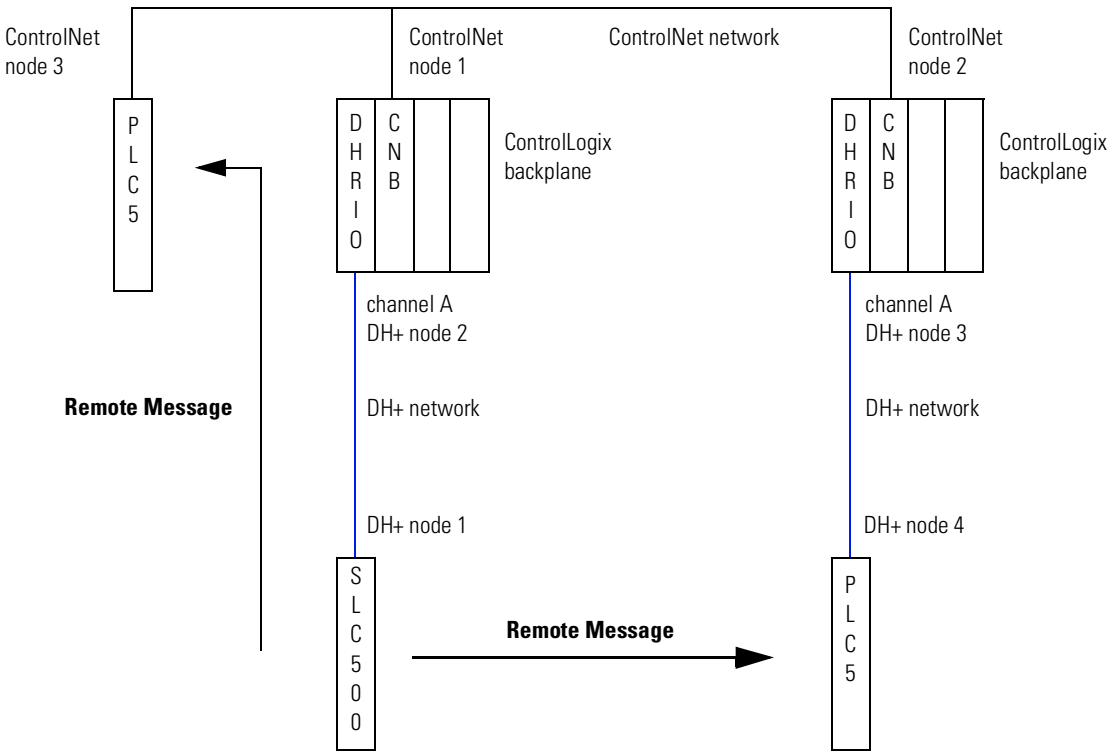
When to Use This Procedure

Use this procedure to route a message from a PLC-5 or SLC 500 controller that is on a DH+ network to a PLC-5 or SLC 500 controller that is on a different network. The controller that receives the message can be on a:

- different DH+ network
- different type of network, such as a ControlNet network

In the following example, ControlLogix chassis route messages to controllers that are on different networks.

EXAMPLE Route messages from a DH+ network

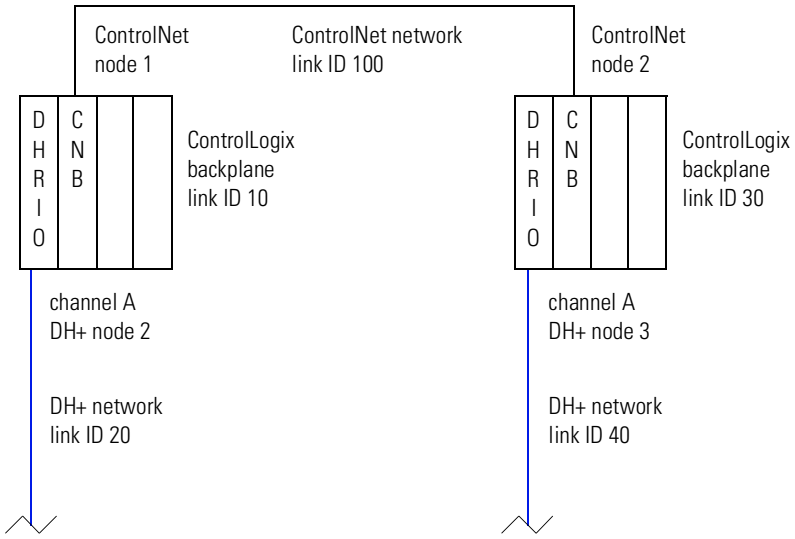


Configure Routing Tables

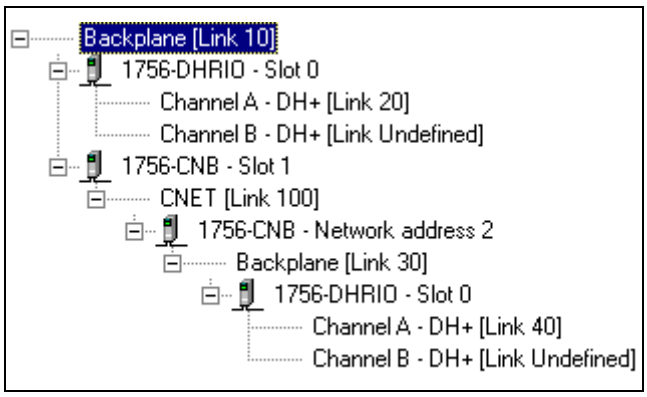
In this task, you configure routing tables for 1756-DHRIO modules. The modules use the routing tables to send the message to the destination.

In the following example, two ControlLogix chassis link different DH+ networks together via a ControlNet network.

EXAMPLE Routing table



Routing table for the left 1756-DHRIO module


Backplane [Link 10]
1756-DHRIO - Slot 0
Channel A - DH+ [Link 20]
Channel B - DH+ [Link Undefined]
1756-CNB - Slot 1
CNET [Link 100]
1756-CNB - Network address 2
Backplane [Link 30]
1756-DHRIO - Slot 0
Channel A - DH+ [Link 40]
Channel B - DH+ [Link Undefined]

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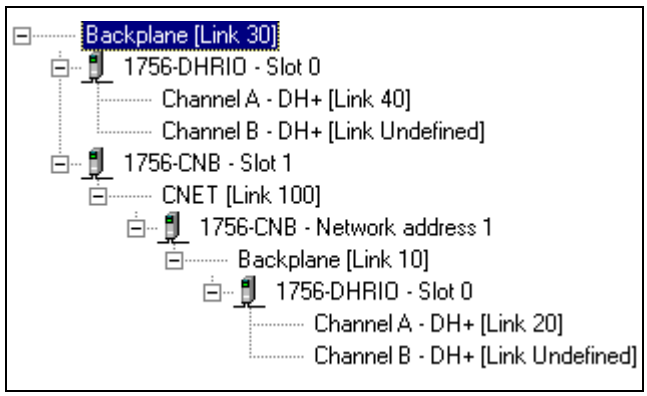
Routing table for the right 1756-DHRIO module


Backplane [Link 30]
1756-DHRIO - Slot 0
Channel A - DH+ [Link 40]
Channel B - DH+ [Link Undefined]
1756-CNB - Slot 1
CNET [Link 100]
1756-CNB - Network address 1
Backplane [Link 10]
1756-DHRIO - Slot 0
Channel A - DH+ [Link 20]
Channel B - DH+ [Link Undefined]

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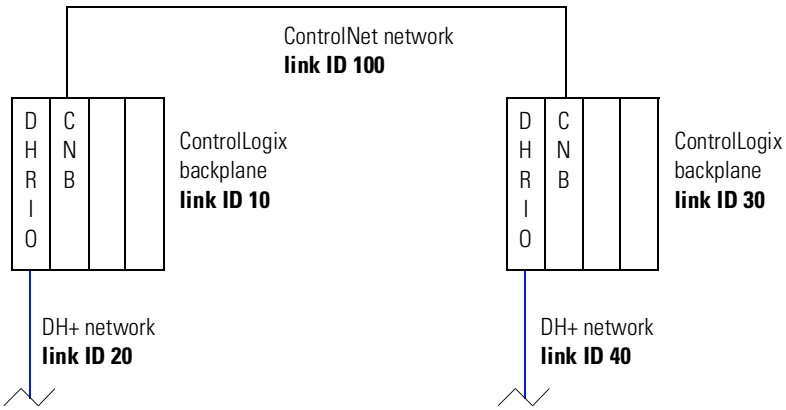
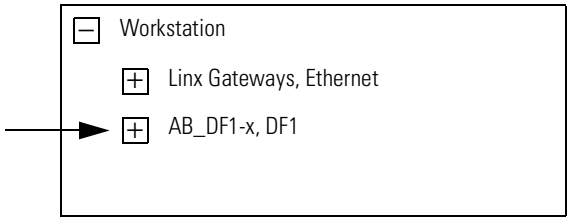
Configure a routing table for each 1756-DHRIO module that is along the route or path to the other controller:

Step:	Detailed actions:
A. For each network and each ControlLogix backplane in your system, designate a unique link ID number.	Here is an example: 
B. Connect the hardware.	1. Install the 1756-DHRIO module. 2. Connect the chassis to a network that you can access from your workstation. For example, perform one of the following: • Connect a serial cable to your workstation and a ControlLogix controller that is in the same chassis as the 1756-DHRIO module. • Connect each chassis to an EtherNet/IP, ControlNet, or DH+ network. 3. Power-up each chassis.

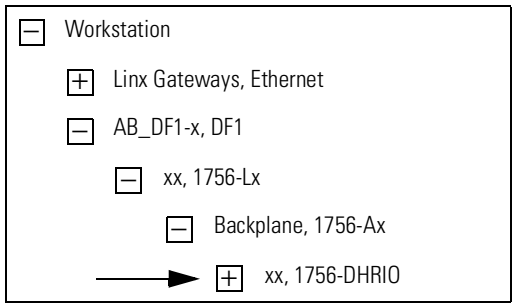
Step:	Detailed actions:
C. Display the routing table.	1. Start RSLinx software.

To expand a network one level, do one of the following:

- Double-click the network.
- Select the network and press the → key.
- Click the + sign.



2. Expand the network from step B. until you see the 1756-DHRIO module.



3. Right-click the DHRIO module and choose *Module Configuration*.
4. Click the *DHRIO Routing Table* tab.

D. Define the link ID of the backplane in which the 1756-DHRIO module resides.	1. At the top of the routing table, right-click the backplane link and choose *Edit Module …* 2. Type the link ID of the backplane and choose *OK*.
E. Define the link IDs of the 1756-DHRIO module.	1. Right-click the 1756-DHRIO module and choose *Edit Module …* 2. For each channel, type the link ID of the corresponding network. 3. Choose *OK*.
F. Add the remaining communication module (s) that are in the backplane (chassis).	1. Right-click the backplane and choose *Add Module …* 2. Select the type of device and choose *OK*. 3. Type or select the slot number of the module. 4. Type the link ID(s) of the network(s) to which the module is connected. 5. Choose *OK*.

<table>
<tr><th>Step:</th><th>Detailed actions:</th></tr>
<tr><td>G. To the network (s) created in the previous step, add the corresponding communication modules in other ControlLogix chassis:</td><td>1. Right-click the link ID and choose Add Module …
2. Select the type of device and choose OK.
3. Type the node or IP address of the module.
4. Type the link ID(s):
<table><tr><th>For this module:</th><th>Type the link ID(s):</th></tr><tr><td>1756-ENET</td><td rowspan="2">of the backplane of the module (i.e., the ControlLogix chassis in which the module resides)</td></tr><tr><td>1756-CNB</td></tr><tr><td>DH+ Bridge</td><td>in the routine table of the added module</td></tr></table>5. Choose OK.</td></tr>
<tr><td>H. Repeat steps F. and G. until the routing table depicts the required networks.</td><td></td></tr>
<tr><td>I. Download and save the configuration.</td><td>1. To download the configuration to the module, choose Apply.
2. To save a copy of the configuration as a file, choose the Save to File button.</td></tr>
</table>

Configure a PLC-5 or SLC 500 Message

IMPORTANT This procedure uses RSLogix 5™ or RSLogix 500™ software, revision 3.x.

A. Using either RSLogix 5 or RSLogix 500 software, as required, open the project for the controller that sends the message.

B. If a SLC 500 controller sends the message, in the MSG instruction, specify the following:

For this:	For a message to a:	Select:
Target Device	SLC 500 controller	*500CPU*
	PLC-5 controller	*PLC5*
Local/Remote	→	*Remote*

C. Display the set-up screen for the message.

D. Select a set-up:

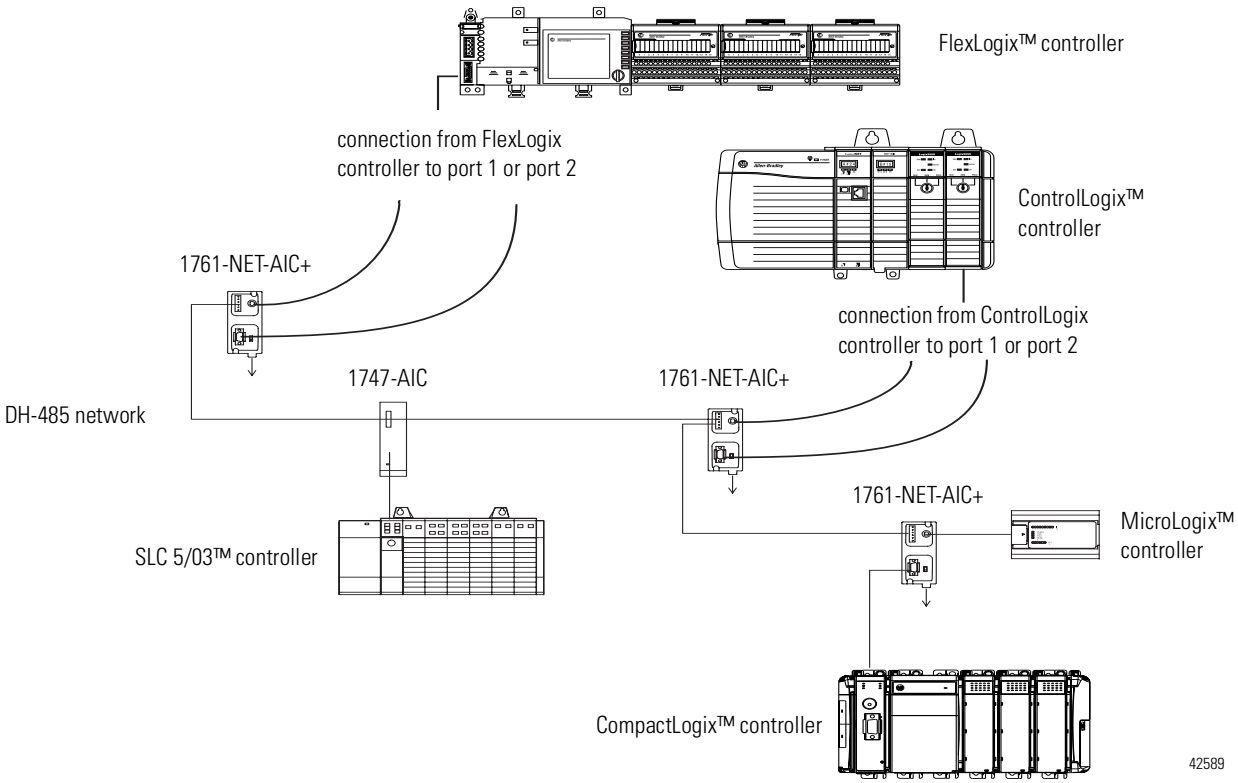
For a message from a:	In this item:	Specify:
PLC-5 controller	Communication Command	*PLC-5 Typed Read* or *PLC-5 Typed Write*
	Data Table Address (This PLC-5)	starting address of the data in the controller that sends the message
	Size in Elements	number of elements to read or write
	Port Number	port through which the message exits
	Data Table Address (Target Device)	starting address of the data in the controller that receives the message
	Local DH+ Node (Octal)	node number of the 1756-DHRIO module that is on the same network as the controller that sends the message
	Local/Remote	*Remote*
	Remote Link Type	*Data Highway*
	Remote Station Address	node number of the controller that receives the message
	Remote Bridge Link ID	link ID of the DH+ network of the controller that receives the message
SLC 500 controller	Communication Command	*PLC5 Read* or *PLC5 Write*
	Data Table Address (This Controller)	starting address of the data in the controller that sends the message
	Size in Elements	number of elements to read or write
	Channel	1
	Data Table Address (Target Device)	starting address of the data in the controller that receives the message
	Local Bridge Addr (octal)	node number of the 1756-DHRIO module that is on the same network as the controller that sends the message
	Remote Bridge Addr	0
	Remote Station Address	node number of the controller that receives the message
	Remote Bridge Link ID	link ID of the network of the controller that receives the message

Notes:

Communicate with Another Controller over a DH-485 Network

When to Use this Procedure

Use this procedure to get information to and from controllers over a DH-485 network.



How to Use This Procedure

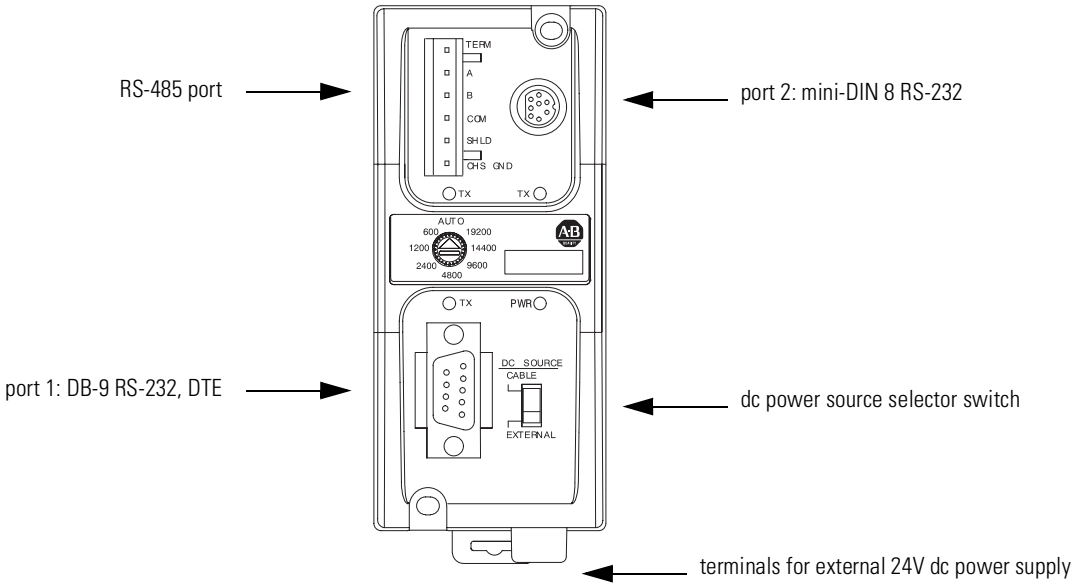
To complete this procedure, do the following steps:

- Step 1: Connect the Controller to an AIC+
- Step 2: Configure the Serial Port
- Step 3: Enter a Message
- Step 4: Configure the Message
- Step 5: Check the LED
- Step 6: Stagger the Messages

Step 1: Connect the Controller to an AIC+

In this step, you install a 1761-NET-AIC Advanced Interface Converter (AIC+), which connects the ControlLogix controller to the DH-485 network.

1761-NET-AIC Advanced Interface Converter (AIC+)



A. Install an AIC+:

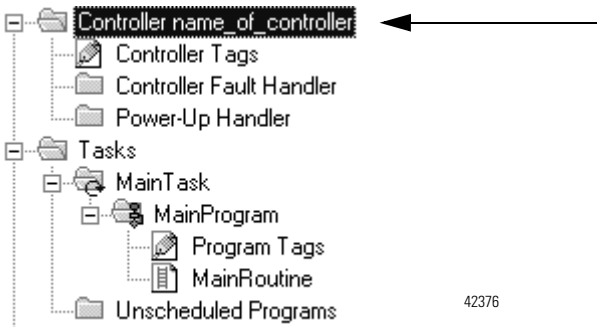
1. Connect the AIC+ to a 24 VDC power supply.
2. On the *DC SOURCE* switch, select *External*.
3. Connect the RS-485 port to the DH-485 network.

B. Connect the serial port of the ControlLogix controller to either port 1 or port 2 of the AIC+:

If you connect to this port:	Over this distance:	Use this cable:
port 1 DB-9 RS-232, DTE connection	< 45 cm (17.7 in)	1761-CBL-AC00
	> 45 cm (17.7 in)	1756-CP3
port 2 mini-DIN 8 RS-232 connection	< 45 cm (17.7 in)	1761-CBL-AP00
	> 45 cm (17.7 in)	1761-CBL-PM02

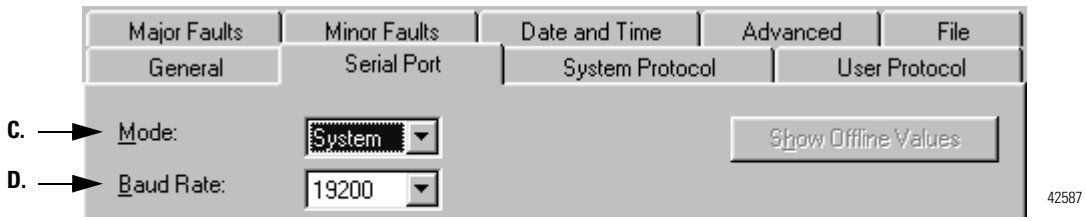
For additional information, see *AIC+ Advanced Interface Converter User Manual*, publication 1761-6.4.

Step 2: Configure the Serial Port



A. Right-click *Controller* `name_of_controller` and select *Properties*.

B. Click the *Serial Port* tab.

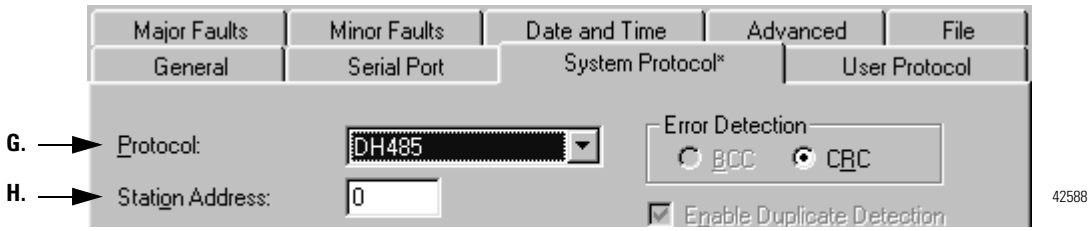


C. Select *System* (default).

D. Select *19200*.

E. Click *Apply*.

F. Click the *System Protocol* tab.



G. Select *DH485*.

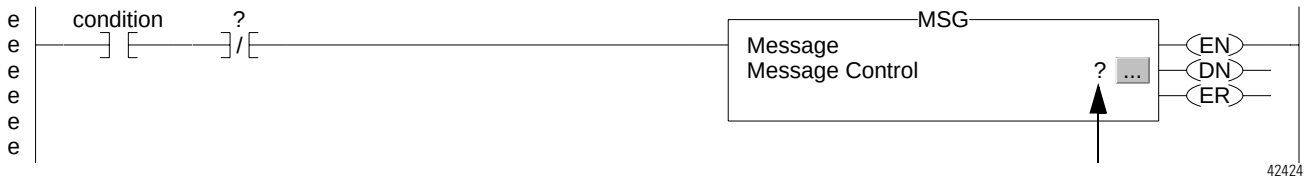
H. Type the address of the controller on the DH-485 network. Follow these guidelines:

- Address 0 is typically reserved for the programming tool.
- Address 1 is typically left open to swap out a controller. Most controllers have a default address of 1.
- The maximum address is 31.
- To optimize network performance, assign addresses in sequential order.
- Assign initiators, such as personal computers, the lowest addresses. This minimizes the time required to initialize the network.

I. Click *OK*.

Step 3: Enter a Message

A. Enter a MSG instruction and associated input instruction (s).



B. In the MSG instruction, type a name for the message control tag and press the *Enter* key.

C. In the MSG instruction, right-click the message control tag and select *New* `tag_name.` (In older revisions of the software, the menu option is *Create* `tag_name.`)

D. From the *Scope* list, select `name_of_controller`*(controller)*, and click *OK*.

E. Enter `message.`EN.

where:

`message` is the message control tag from step B.

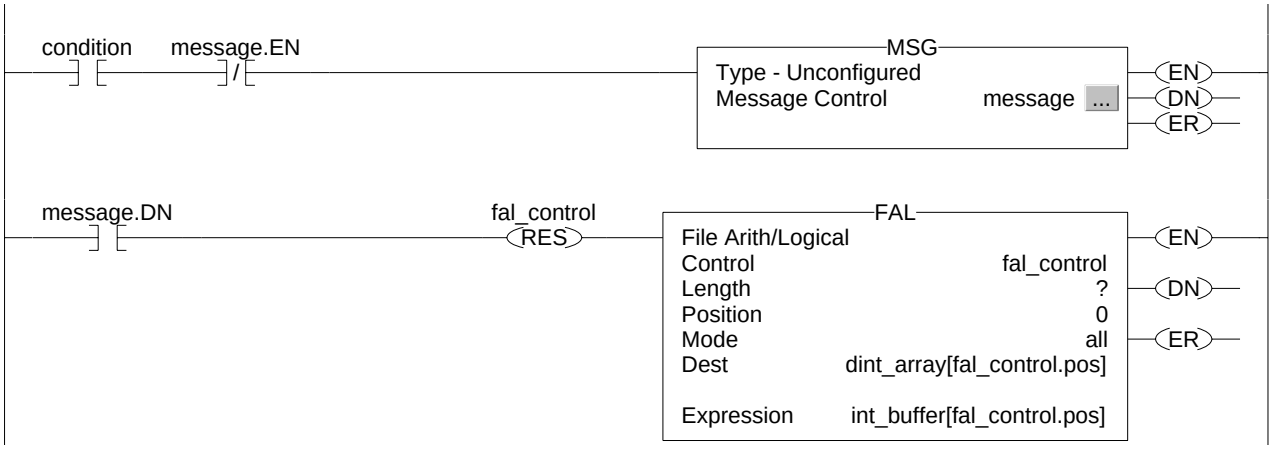
F. If your message is to an SLC 500™ or MicroLogix™ controller *and* it reads or writes integers (not REALs), use a buffer of INTs in the message.

- ControlLogix controllers execute more efficiently and use less memory when working with 32-bit integers (DINTs). Use the DINT data type for integers whenever possible.
- SLC 500 and MicroLogix controllers require 16-bit integers.
- Use an INT buffer in the message and move the data into or out of the buffer as required.

The following examples show how to use a buffer of INTs

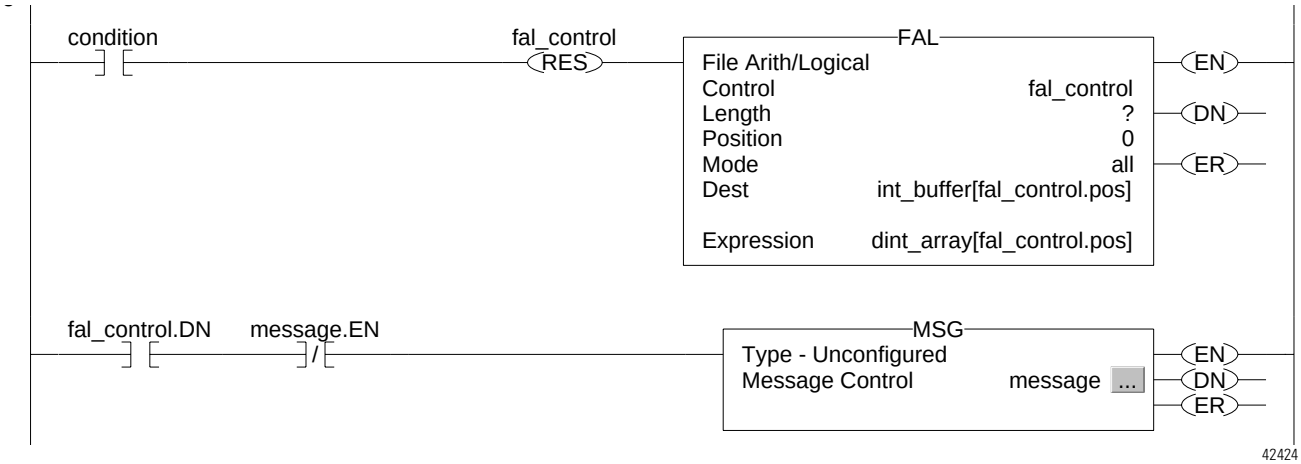
EXAMPLE Read integers from a MicroLogix controller

When *condition* turns on, reads 16-bit integer values (INTs) and stores them in *int_buffer*. Then the FAL instruction moves the values to *dint_array*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the ControlLogix controller.



EXAMPLE Write integers to a MicroLogix controller

When *condition* turns on, moves the values in *dint_array* to *int_buffer*. This converts the values to 16-bit integers (INTs). Then the message instruction sends *int_buffer* to the other controller.



Where:	Is an:
dint_array	array of DINTs that are used in the ControlLogix controller
int_buffer	array of INTs with the same number of elements as *dint_array*

Step 4: Configure the Message

A. In the MSG instruction, click ... .

B. Select a configuration for the message:

Table 19.A Message to a ControlLogix or FlexLogix controller

If the data is:	And you want to:	For this item:	Type or select:
structure (s)	read (receive) the data	Message Type	*CIP Data Table Read*
		Source Element	first element of the tag that contains data in the other controller
		Number Of Elements	number of elements to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) the data	Message Type	*CIP Data Table Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of elements to transfer
		Destination Element	first element of the tag for the data in the other controller
not structure (s)	read (receive) the data	Message Type	*PLC5 Typed Read*
		Source Element	*@name* where: *name* is the first element of the tag that contains data in the other controller.
		Number Of Elements	number of elements to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) the data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of elements to transfer
		Destination Element	*@name* where: *name* is the first element of the tag for the data in the other controller.

Table 19.B Message to an SLC 500 or MicroLogix controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., F8:0)

C. Click the *Communication* tab.

D. In the Path box, type the following path:

2, `station_address`

where:

`station_address` is the DF1 address of the controller that is receiving the message.

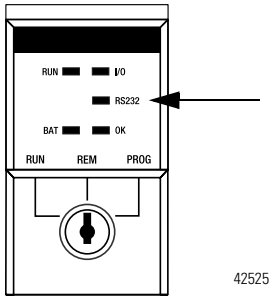
E. Leave the communication method at the default settings of:

- *CIP*
- *Cache Connections* (This check box does not apply to messages from the serial port.)

F. Click *OK*.

Step 5: Check the LED

Once you download the project to the controller, use the RS232 LED, on the front of the controller, to determine if there are other stations on the DH-485 network.



If the RS232 LED is:	Then:
flashing	There are no other stations on the DH-485 network.
steady	There is at least one other station on the DH-485 network.

Step 6: Stagger the Messages

As you add messages to your project, you may have to coordinate the execution of the messages. To avoid errors and assure that each message is processed, follow these rules:

Rule 1:	Enable no more than 16 messages at one time (including block transfers).
Rule 2:	Enable no more than 10 of the following types of messages at one time: • CIP data table reads or writes that are *not* cached • CIP generic • PLC2, PLC3, PLC5, or SLC (all types) • block transfer reads or writes that are *not* cached

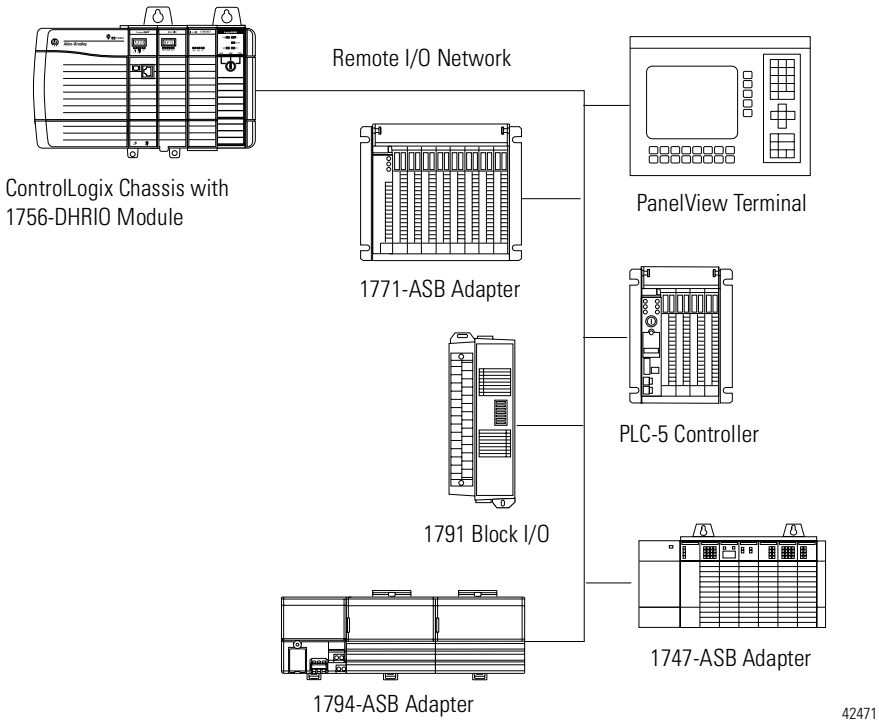
If the number of messages in your application exceeds rules 1 and 2, then stagger the execution of your messages. Here are some options:

- Send each message in sequence
- Send the messages in groups that are within the limits of rules 1 and 2

Communicate Over a Remote I/O Network

When to Use This Procedure

Use this procedure to monitor and control I/O over a remote I/O network.

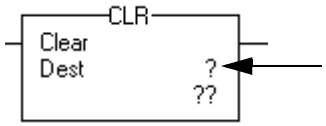


How to Use This Procedure

TIP

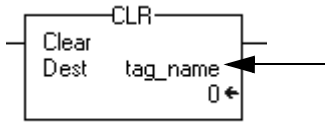
To create and manage tags as you program your logic, use these tips:

- To create a tag:



1. Type the name for the tag.
2. Right-click the tag and choose *New "tag_name"*.

- To change the name of a tag:



Right-click the tag and choose *Edit "tag_name" Properties*.

If you have not already done so in a previous procedure, do the following preliminary tasks:

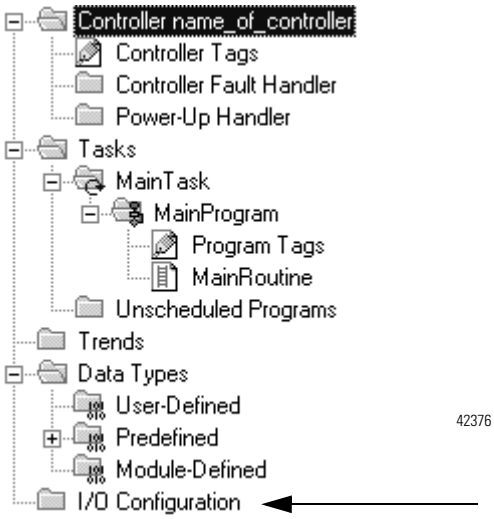
- Add a 1756-DHRIO Module

To complete this procedure, do the following tasks:

- Add a Remote I/O Adapter
- Add a Block Transfer Module
- Communicate with Block Transfer Modules, using either of these procedures:
  - Read or Write Data To or From a Block Transfer Module
  - Read or Write Data To or From Multiple Block Transfer Modules
- Address I/O
- Validate Connections
- Stagger the Messages

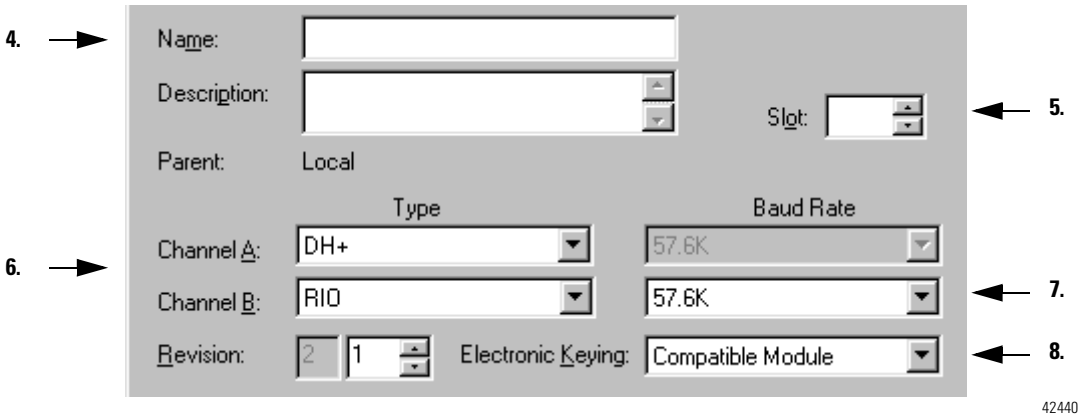
Add a 1756-DHRIO Module

1. Open the RSLogix 5000™ project offline.



2. Right-click *I/O Configuration* and select *New Module*.

3. Select your series of 1756-DHRIO module and click *OK*.



4. Type a name for the module (i.e., *name_of_DHRIO*).

5. Type or select the slot number where the module is installed

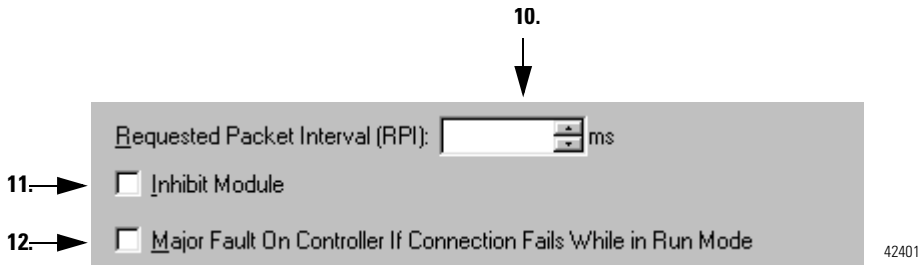
6. For the channel that is connected to the remote I/O network, select *RIO*.

7. Select the baud rate of the network.

8. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

9. Click *Next*.



10. Type the rate at which the module must communicate with the controller.

11. Initially, do you want to prevent the module from communicating with the controller?

If:	Then:
Yes	Select the check box.
No	Leave the check box cleared (unchecked).

EXAMPLE Inhibit a module

Use the Inhibit Module check box to make it easier to test a system:

- Initially, inhibit the module.
- When you are ready to test the devices that are associated with the module, clear the check box.

12. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

13. Click *Finish*.

Add a Remote I/O Adapter

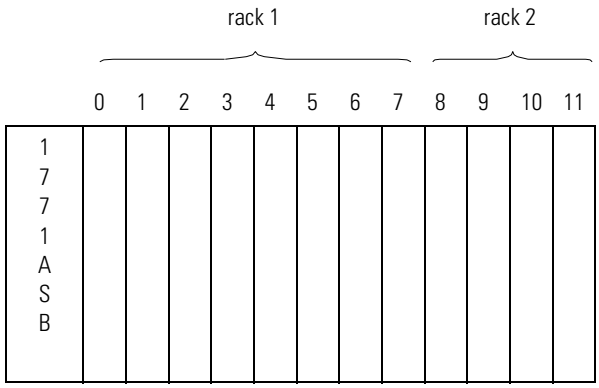
In this task, you add remote I/0 adapters for each rack, or portion of a rack, in the chassis:

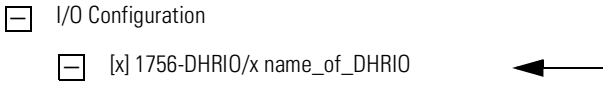
If the chassis contains:	Then add:
less than 1 rack of I/O	1 adapter for the chassis
1 rack of I/O	
more than 1 rack of I/O	1 adapter for each rack

EXAMPLE

Add remote I/O adapters

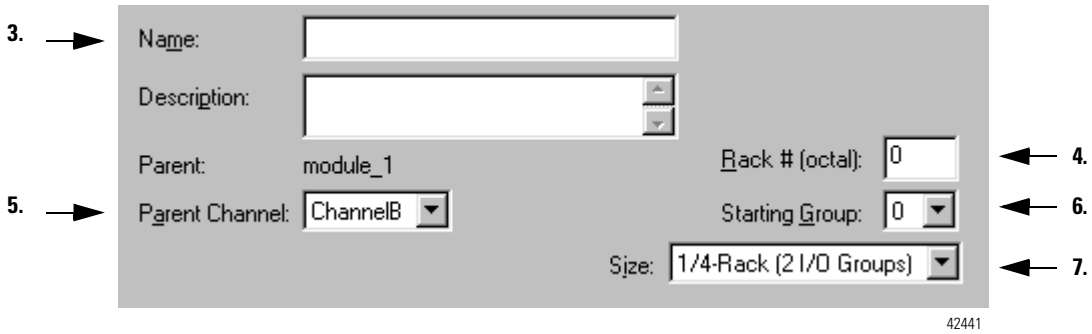
The I/O configuration of the controller requires two remote I/O adapters for this chassis. One adapter is for rack 1, and the second adapter is for the 1/2 of rack 2.





1. Right-click *name_of_DHRIO* and select *New Module*.
2. Select an adapter module and click *OK*.

If the I/O is:	Then select:
1747	1747-ASB
1771	1771-ASB
1791	RIO-ADAPTER
1794	1794-ASB



3. Type a name for the adapter module. Use a name that identifies the I/O of this adapter.

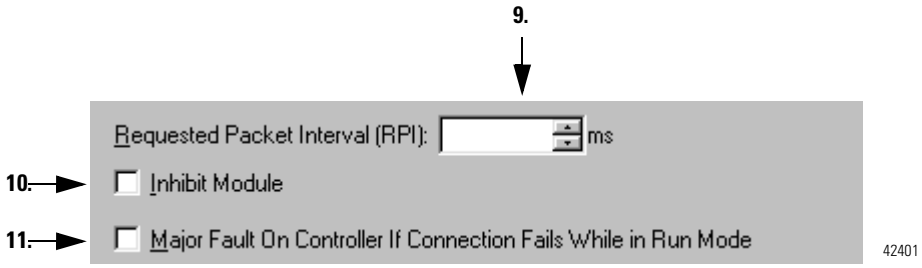
4. Type or select rack number of this module.

5. Select the channel on 1756-DHRIO module that is network is connected to.

6. Type or select the starting group number.

7. For the rack number of this adapter, select the number of groups in this chassis. Round up to the nearest even number of groups.

8. Click *Next*.



9. Type the rate at which the I/O of this adapter must update.

10. Initially, do you want the module to communicate with the controller?

If:	Then:	Notes:
Yes	Leave the check box cleared (unchecked).	
No	Select the check box.	When you test this portion of the system, clear the check box.

11. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

12. Click *Finish*.

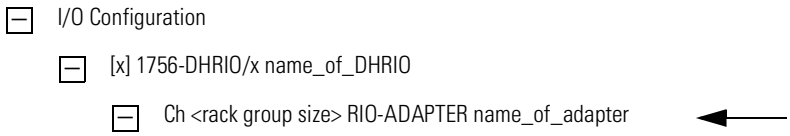
Add a Block Transfer Module

Do any modules require block transfers?

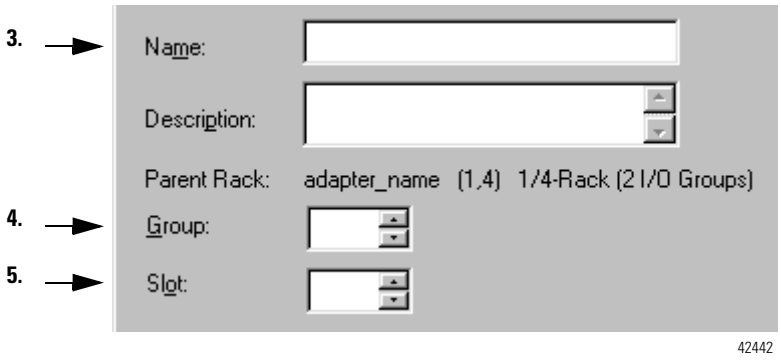
If:	Then:
Yes	Complete the steps in this section (Add a Block Transfer Module)
No	Go to Address I/O on page 20-26..

Though not required, when the module is in the I/O configuration, you gain these advantages:

- It is easier to complete the communication path to the module.
- The I/O configuration provides documentation about the module.



1. Right-click *name_of_adapter* and select *New Module*.
2. Select *RIO-MODULE* and click *OK*.

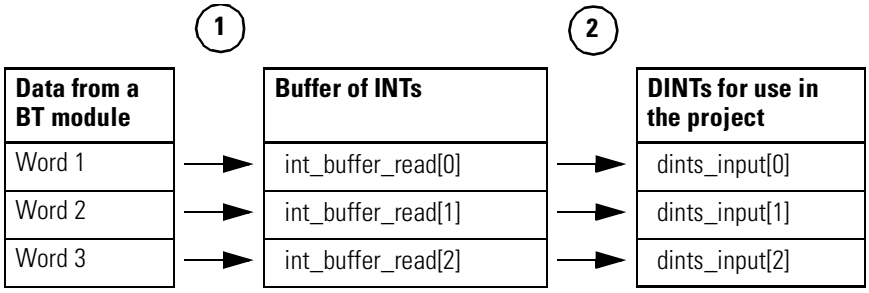


3. Type a name for the module.
4. Type or select the group number of the module.
5. Type or select the slot number that the module is in.
6. Click *Finish*.

Read or Write Data To or From a Block Transfer Module

Use this procedure to transfer data to or from a module that requires block transfers.

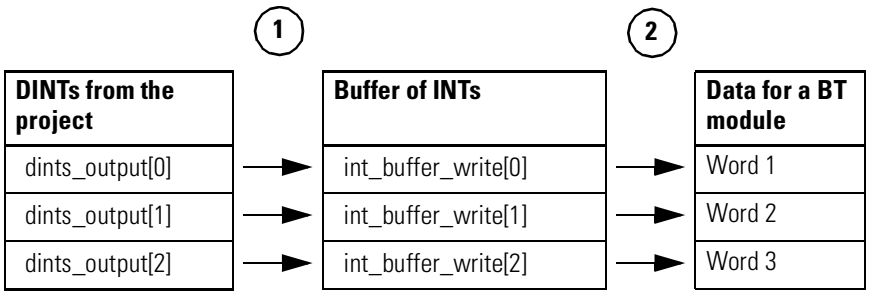
Block Transfer Read



1. The MSG instruction reads 16-bit integers (INTs) from the BT module and stores them in a temporary array of INTs.

2. An FAL instruction converts the INTs to 32-bit integers (DINTs). Logix5000 controllers execute more efficiently and use less memory when working with DINTs.

Block Transfer Write



1. An FAL instruction converts the 32-bit integers (DINTs) from the Logix5000 controller to 16-bit integers (INTs):

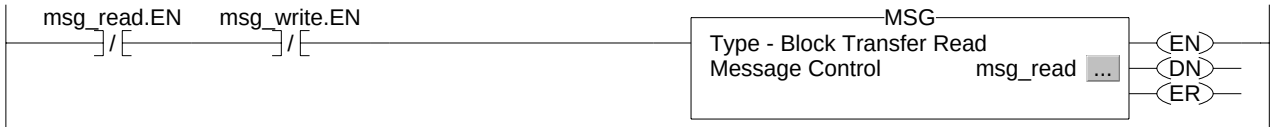
   - Logix5000 controllers execute more efficiently and use less memory when working with DINTs.
   - The instruction stores the data in a temporary array of INTs.

2. The MSG instruction writes the INTs from the temporary array to BT module.

Read Data From a Block Transfer Module

1. Enter the following rung:

Reads 16-bit integers (INTs) from the module and stores them in *int_buffer_read*. (Only include the *msg_write.EN* tag and associated instruction if you also send a block transfer write message to the same module.)



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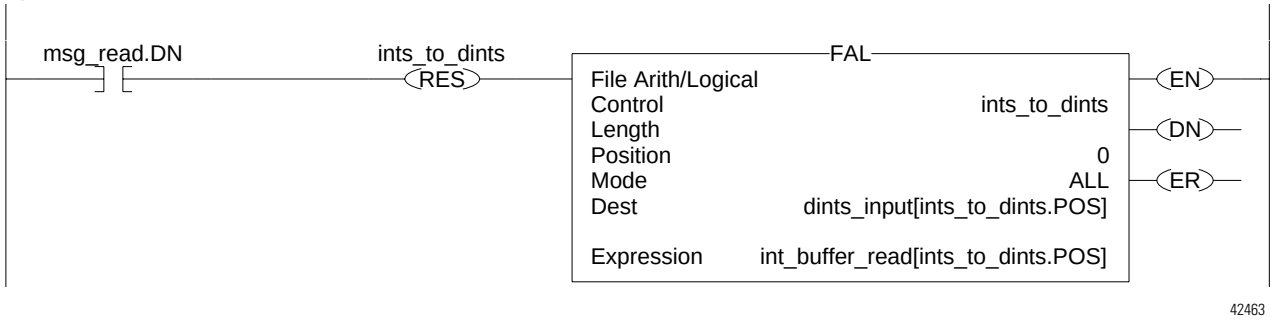
Tag Name:	Description:	Data Type:	Scope:
msg_read	block transfer read message	MESSAGE	*name_of_controller* (controller)
msg_write	block transfer write message to the same module	MESSAGE	*name_of_controller* (controller)

2. Enter the following rung:

When *msg_read* is done, the FAL instruction moves the values in *int_buffer_read* to *dints_input*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the controller.



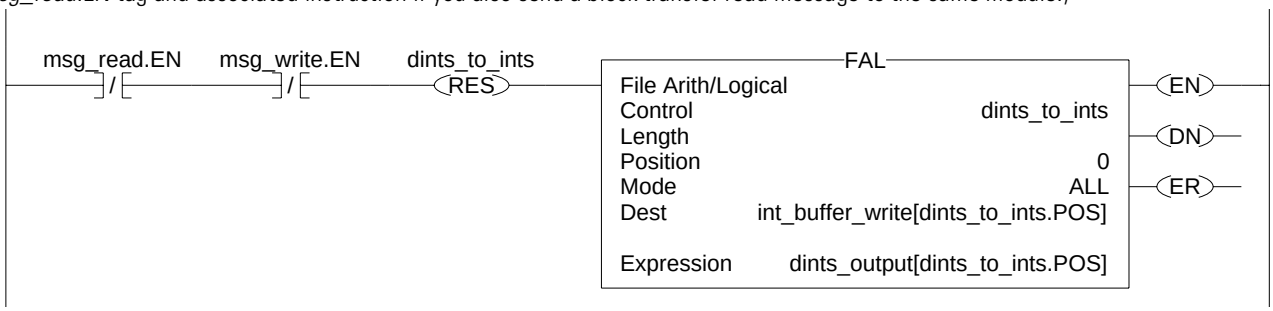
Tag Name:	Description:	Data Type:	Scope:
int_buffer_read	array that stores the data from the BT module	INT [*length*]	*name_of_controller* (controller)
ints_to_dints	converts the 16-bit integers from the BT module to 32-bit integers for the Logix5000 controller	CONTROL	*name_of_controller* (controller)
FAL Length	number of elements to convert	immediate value equal to *length*	
dint_inputs	array that stores the input data from the module for use by the controller	DINT [*length*]	*name_of_controller* (controller)

Where:	Is the:
length	number of elements to transfer

Write Configuration or Output Data To a Block Transfer Module

1. Enter the following rung:

The application writes configuration and output data to *dints_output*, which is an array of DINTs. Before the controller sends the data to the module, the FAL instruction moves the values to *int_buffer_write*. This converts them to 16-bit integers (INTs). (Only include the *msg_read.EN* tag and associated instruction if you also send a block transfer read message to the same module.)

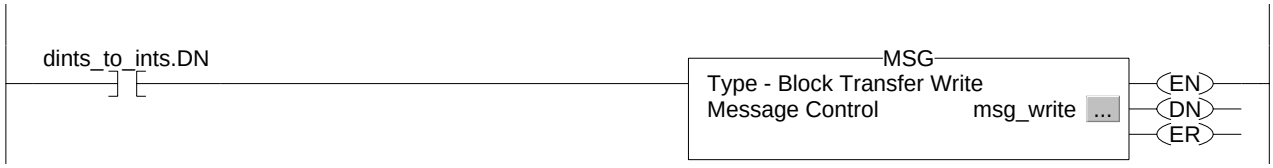


Tag Name:	Description:	Data Type:	Scope:
msg_read	block transfer read message to the same module	MESSAGE	*name_of_controller* (controller)
msg_write	block transfer write message	MESSAGE	*name_of_controller* (controller)
dints_to_ints	converts the 32-bit integers from the Logix5000 controller to 16-bit integers for the BT module	CONTROL	*name_of_controller* (controller)
FAL Length	number of elements to convert	immediate value equal to *length*	
int_buffer_write	array that stores the data to send to the BT module as 16-bit integers	INT [*length*]	*name_of_controller* (controller)
dints_output	array that stores the output data that other instructions produce for the module	DINT [*length*]	*name_of_controller* (controller)

Where:	Is the:
length	number of elements to transfer

2. Enter the following rung:

After the FAL instruction converts the DINTs to INTs, the MSG instruction sends the data in *int_buffer_write* to the module.



Configure the Messages

1. In the MSG instruction, click ... .
2. Select a configuration:

If you want to:	For this item:	Type or select:
read input data	Message Type	*Block Transfer Read*
	Number Of Elements	number of INTs to read
	Destination Tag	`int_buffer_read` *[0]*
write configuration or output data	Message Type	*Block Transfer Write*
	Source Tag	`int_buffer_write` *[0]*
	Number Of Elements	number of INTs to write

3. Click the *Communication* tab.
4. Click *Browse …*
5. Select the RIO-MODULE and click *OK*.
6. How many devices require block transfer instructions?

If:	Then:
16 or less devices	Leave the *Cache Connection* check box selected (checked).
more than 16 devices	A. Select 16 devices that require the most frequent updates. B. Is this message to one of those devices?

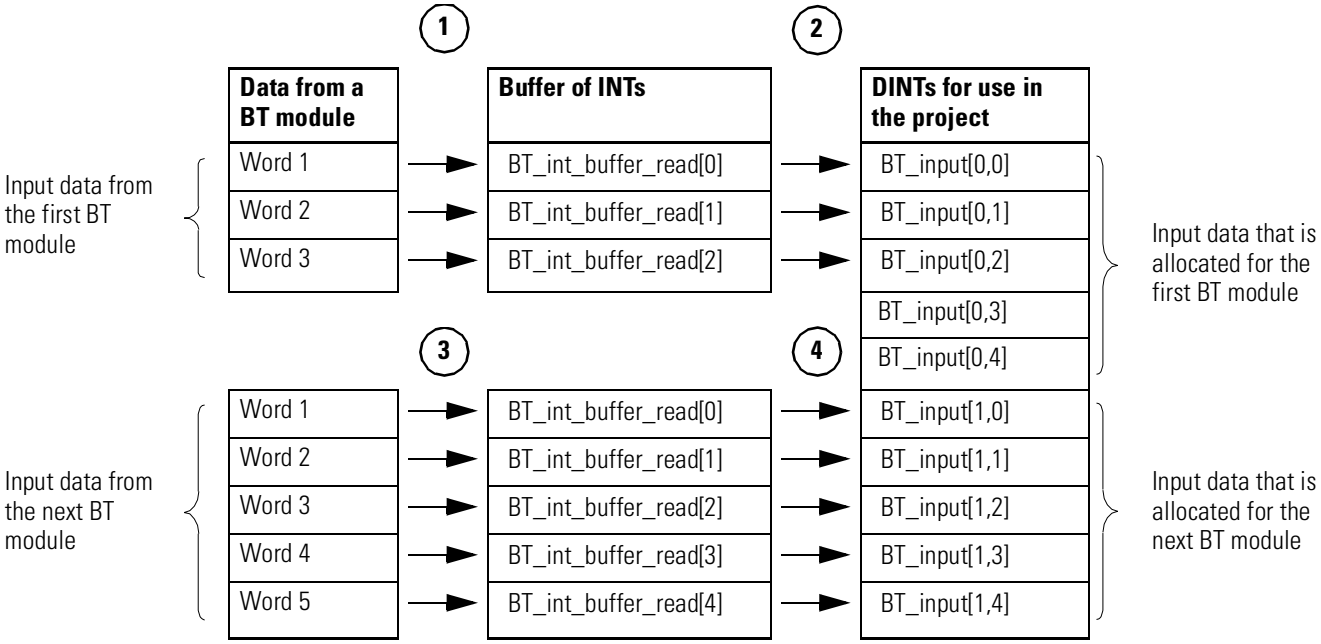
If:	Then
Yes	Leave the *Cache Connection* check box selected (checked).
No	Clear the *Cache Connection* check box.

7. Click *OK*.

Read or Write Data To or From Multiple Block Transfer Modules

Use this procedure to program a single MSG instruction to read data from multiple block transfer modules.

The following diagram shows the flow of data for a block transfer read. The block transfer write sequence works in the opposite order.



1. The MSG instruction reads 16-bit integers (INTs) from the first BT module and stores them in a temporary array of INTs.

2. An FAL instruction converts the INTs to 32-bit integers (DINTs). Logix5000 controllers execute more efficiently and use less memory when working with DINTs.

3. The MSG instruction reads the next module. This procedures lets you vary the number of INTs that you read from each module.

4. The FAL instruction moves the data to the next element of dimension 0 of the DINT array. Each element of this dimension corresponds to a different BT module.

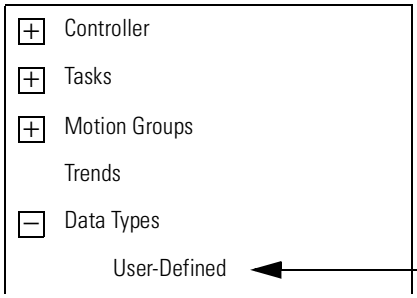
To read multiple block transfer modules:

- Create a User-Defined Data Type
- Create the Data Array
- Send the Message to a BT Module
- Enter the Message Properties for Each Module
- Convert the INTs to DINTs
- Step to the Next BT Module

To write data to multiple block transfer modules, see the logic on page 20-24.

Create a User-Defined Data Type

Create the following data type. You will use this for the array that stores the message properties for each module.



1. Right-click and select *New Data Type*.
2. Assign the following:

Name	BT_CONFIGURATION			
Description	Configuration properties for a block transfer message to a specific module			
Members				
	Name	**Data Type**	**Style**	**Description**
	REQ_LEN	INT	Decimal	number of elements (INTs) to read or write
	Channel	SINT	ASCII	channel (A or B) of the 1756-DHRIO module to which this module is connected
	Rack	SINT	Octal	rack number of the module (octal)
	Group	SINT	Decimal	group number of the module
	Slot	SINT	Decimal	slot number of the module
	⊞ Path	STRING		path to the 1756-DHRIO module (Use the Message Path editor to assign the path.)

Create the Data Array

1. Enter the following rung:

The SIZE instruction determines the number of elements in the first dimension (Dim 0) of the *BT_input* array. Since this dimension contains one element for each BT module, this instruction determines how many modules the MSG instruction must read. A subsequent rung uses this number to determine the end of the sequence of MSGs.

2. Right-click each undefined tag, select *New "name"*, and assign the following properties:

Name:	Description:	Data Type:	Scope:
BT_input	data from each BT module • The first dimension represents each module. • The second dimension represents the data from a module.	DINT [*number*, *length*]	*name_of_controller* (controller)
BT_input_modules	number of modules that the MSG instruction must read	DINT	*name_of_controller* (controller)

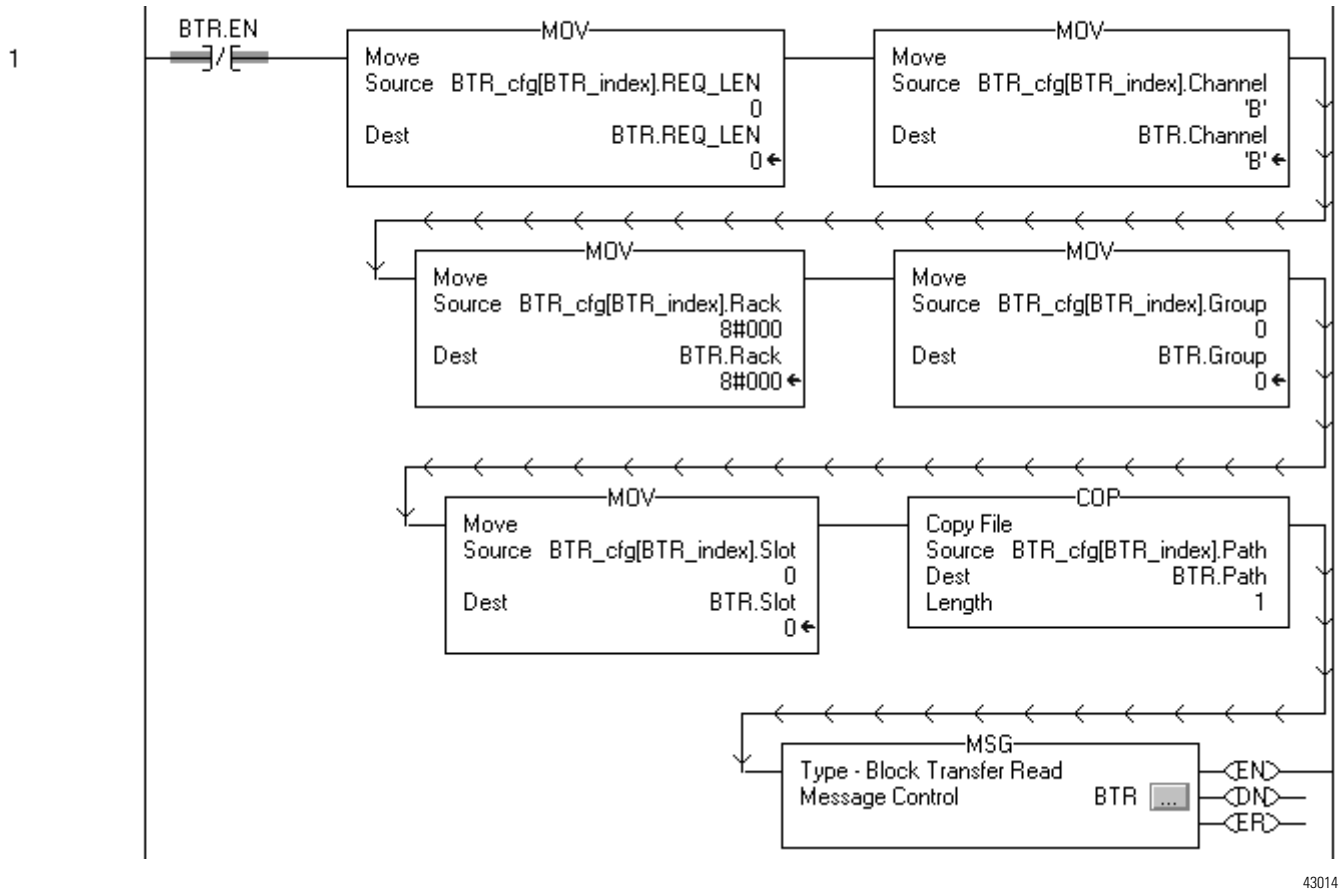
Where:	Is the:
number	number of modules that this message reads
length	maximum number of elements in any of the block transfers

Send the Message to a BT Module

1. Enter the following rung:

The MSG instruction reads the input values from a BT module and stores the values in *BTR_int_buffer_read*.

- Each time the instruction is done, it automatically restarts and sends another message.
- Prior to each message, the series of MOV and COPY instructions load the appropriate configuration properties into the MSG instruction so it can read the next BT module. The configuration properties load from the *BTR_cfg* array.
- After each MSG, a subsequent rung increments the *BTR_index* tag. This loads the configuration properties for the next module into the MSG instruction before it executes again.

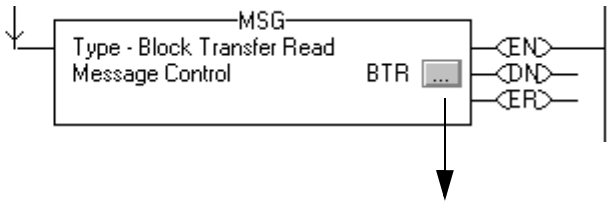


2. Right-click each undefined tag, select *New "name"*, and assign the following properties:

Name:	Description:	Data Type:	Scope:
BTR	block transfer message that reads data from each BT module	MESSAGE	*name_of_controller* (controller)
BTR_cfg	array of configuration properties for each BT module	BT_CONFIGURATION [*number*]	*name_of_controller* (controller)
BTR_index	controls which BT module that the MSG instruction reads	DINT	*name_of_controller* (controller)

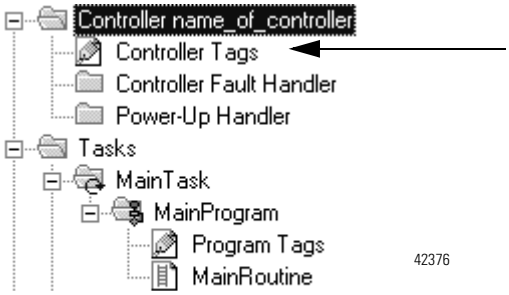
Where:	Is the:
number	number of modules that this message reads

3. Configure the message:



On this tab:	For this item:	Type or select:
Configuration	Message Type	*Block Transfer Read*
	Number Of Elements	1 (The dialog box requires an initial value.)
	Destination Tag	*BTR_int_buffer_read* To create this tag: A. Click *New Tag*. B. Type the name. C. In the Data type box, type INT[*length*], where *length* equals the *length* variable of the *BT_input* tag from page 20-18. D. Choose *OK*.
Communication	Path	*Path to the 1756-DHRIO module:* A. Click *Browse…* B. Select the RIO-MODULE with which you want to communicate. C. Choose *OK*. This complete the Module Address properties. Although your logic will change the path and module address, the Message Properties dialog box requires an initial set of properties.
	RIO or ControlNet	*RIO*
	Cache Connection check box	Clear the *Cache Connection* check box..

Enter the Message Properties for Each Module



1. Double-click *Controller Tags*.
2. Enter the message properties for each BT module.

Tag Name	Value
⊟ BTR_cfg	(…)
⊟ BTR_cfg[0]	(…)
⊞ BTR_cfg[0].REQ_LEN	number of elements to transfer
⊞ BTR_cfg[0].Channel	channel (A or B) of the 1756-DHRIO module that is connected to the RIO network
⊞ BTR_cfg[0].Rack	rack number of the module (octal)
⊞ BTR_cfg[0].Group	group number of the module (depends on chassis addressing)
⊞ BTR_cfg[0].Slot	slot number of the module (depends on chassis addressing)
⊞ BTR_cfg[0].Path	path to the 1756-DHRIO module: A. Right-click and select *Go to Message Path Editor*. B. Select the 1756-DHRIO module. C. Choose *OK*.
⊞ BTR_cfg [1]	

Properties for the first BT module

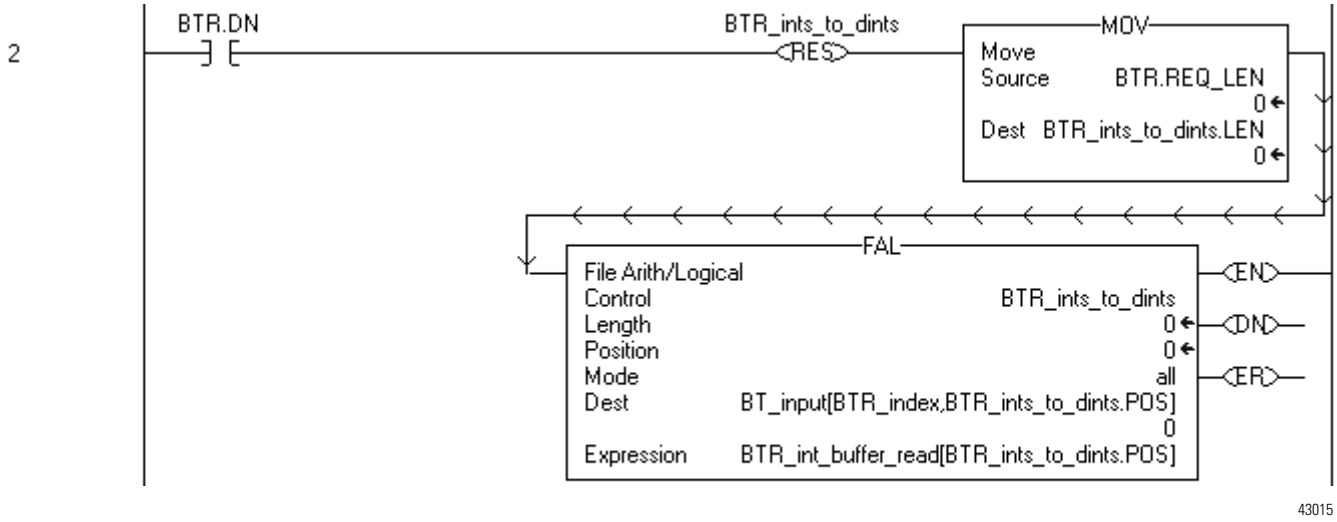
Properties for the next BT module

Convert the INTs to DINTs

1. Enter the following rung:

After the MSG instruction reads data from a module (*BTR.DN* is on), this rung converts the INT values from the BT module to DINT values for use in the project:

- The MOV instruction sets the length of the FAL instruction equal to the number of elements that the MSG reads.
- The FAL instruction then loads the values from *BTR_int_buffer_read* into *BT_input*. This converts the values to DINTs for use in the project.
- *BTR_index* determines where in the first dimension of *BT_input* to store the values. Each element of this dimension corresponds to a specific BT module.



2. Right-click each undefined tag, select *New "name"*, and assign the following properties:

Name:	Description:	Data Type:	Scope:
BTR_ints_to_dints	converts the 16-bit integers from the BT module to 32-bit integers for the Logix5000 project	CONTROL	*name_of_controller* (controller)

Step to the Next BT Module

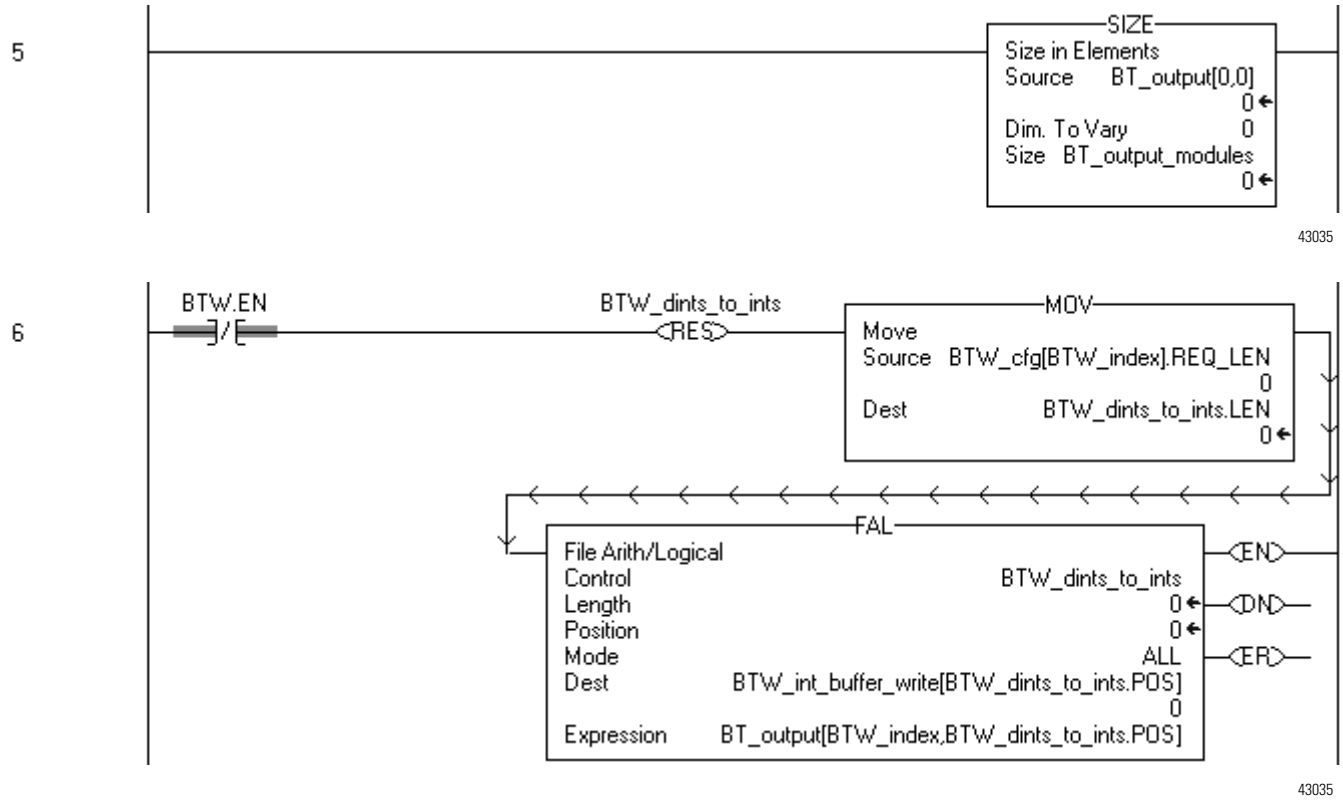
1. Enter the following rung:

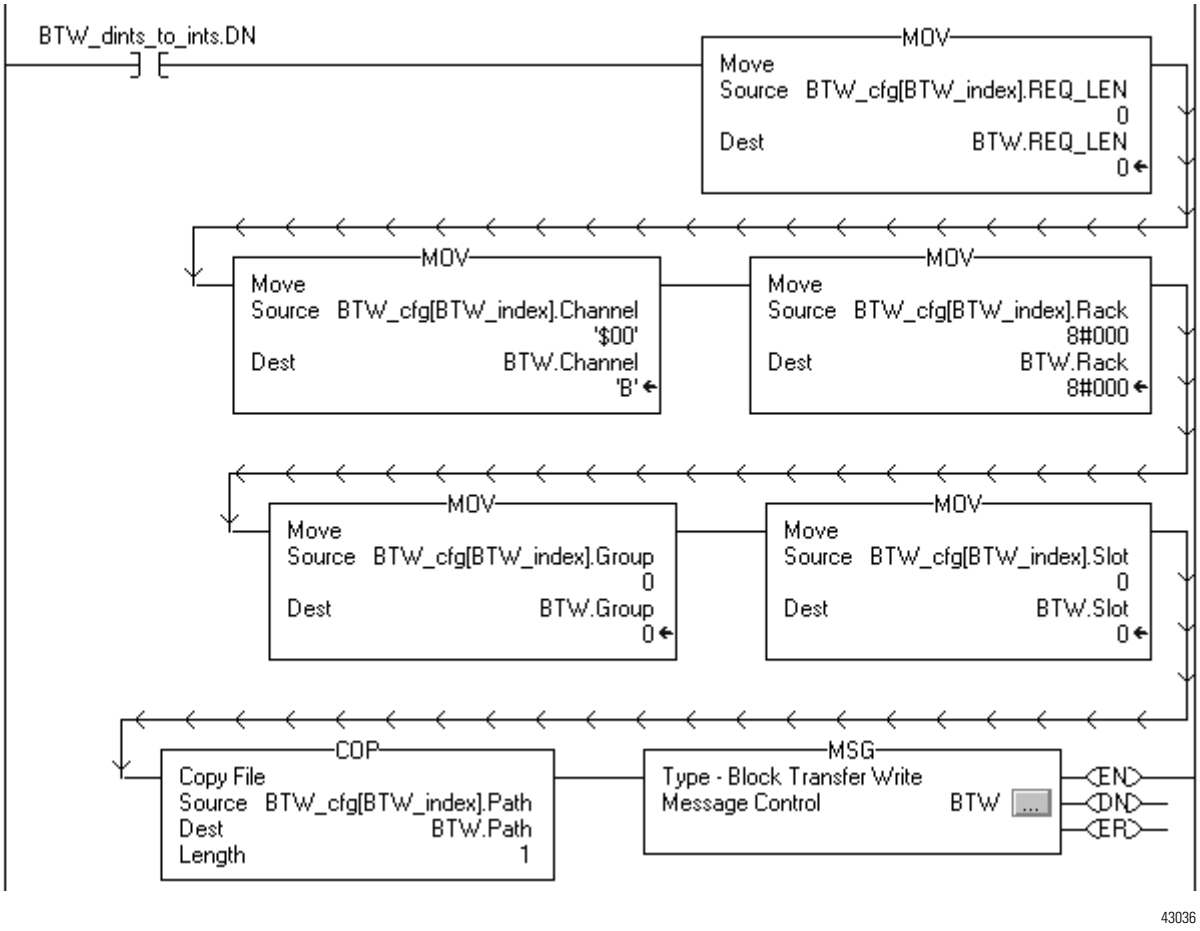
After the MSG instruction reads data from a module and the FAL converts it to DINTs (*BTR_ints_to_dints.DN* is on), the ADD instruction increments the *BTR_index*. This lets the MSG instruction read the next module.

2. Enter the following rung:

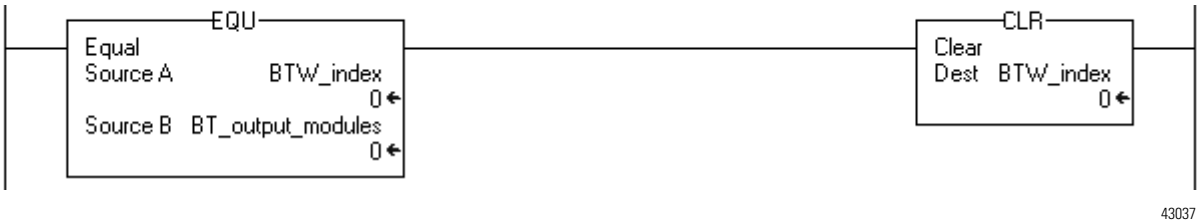
If the EQU instruction is true, the MSG instruction has read the last BT module. The CLR instruction resets *BTR_index* to zero. This lets the MSG instruction start the series of reads again, starting with the first module.

Write Data to Multiple Block Transfer Modules




7
BTW_dints_to_ints.DN
MOV
Move
Source BTW_cfg[BTW_index].REQ_LEN
0
Dest BTW.REQ_LEN
0
MOV
Move
Source BTW_cfg[BTW_index].Channel
'$00'
Dest BTW.Channel
'B'
MOV
Move
Source BTW_cfg[BTW_index].Rack
8#000
Dest BTW.Rack
8#000
MOV
Move
Source BTW_cfg[BTW_index].Group
0
Dest BTW.Group
0
MOV
Move
Source BTW_cfg[BTW_index].Slot
0
Dest BTW.Slot
0
COP
Copy File
Source BTW_cfg[BTW_index].Path
Dest BTW.Path
Length 1
MSG
Type - Block Transfer Write
Message Control BTW
EN
DN
ER
43036

8
BTW.DN
ADD
Add
Source A 1
Source B BTW_index
0
Dest BTW_index
0
43037


9
EQU
Equal
Source A BTW_index
0
Source B BT_output_modules
0
CLR
Clear
Dest BTW_index
0
43037

Address I/O

To monitor or control an I/O device, assign the tag name of the device to an instruction in your logic:

- For step-by-step instructions on how to enter logic and tag names, see the *Logix5000 Controllers Common Procedures*, publication 1756-PM001.
- All the data for I/O modules is at the controller scope. As you assign addresses, click the *Controller Scoped Tags* button to see the I/O tags.
- Use the following table to select the address of an I/O device:

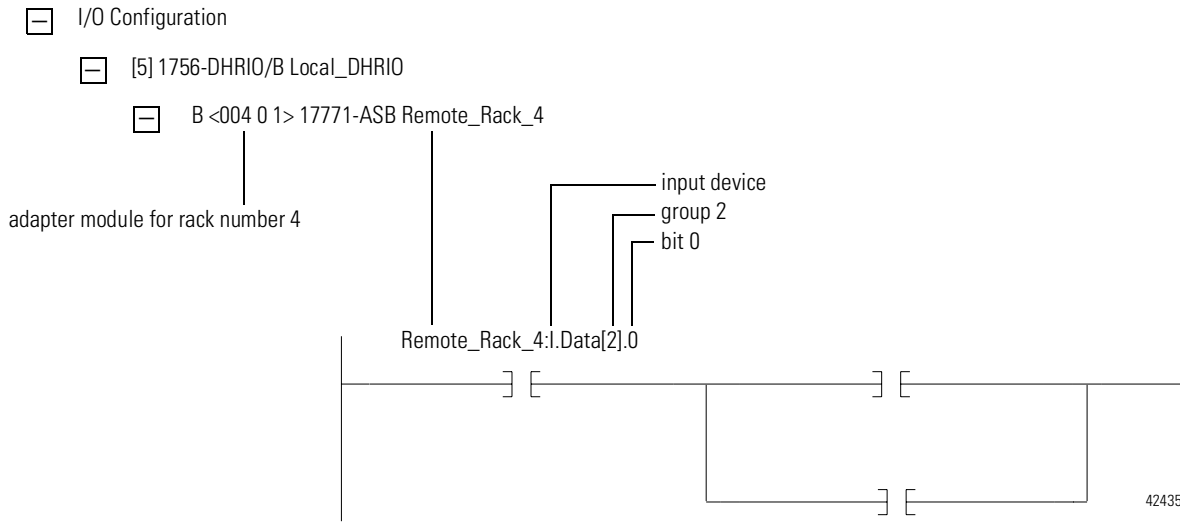
If the device is:	Then use this address:
digital	*name*:*type*.Data[*group*].*bit*
analog	element of the array that stores the data for or from this device

Where:	Is:
name	name of the remote I/O adapter, such as the 1771-ASB module • Use the name for the rack that contains the module to which this device is wired. • Use the name from the I/O configuration of the controller.
type	type of device:

If:	Then:
input	I
output	O

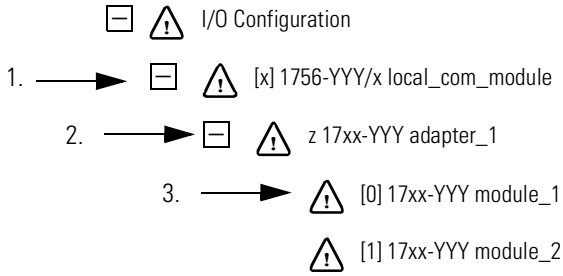
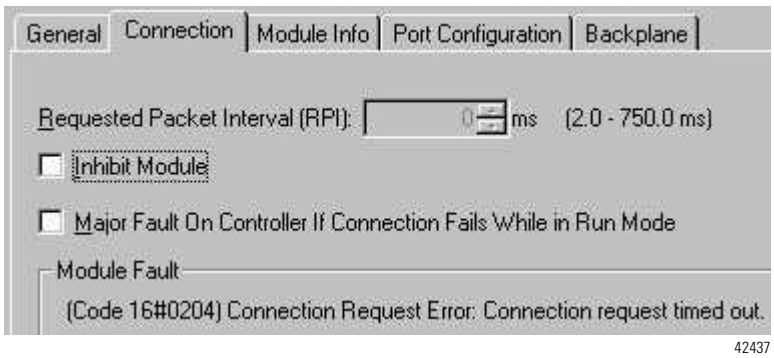
group	group number of the module to which this device is wired
bit	point (bit) number to which this device is wired

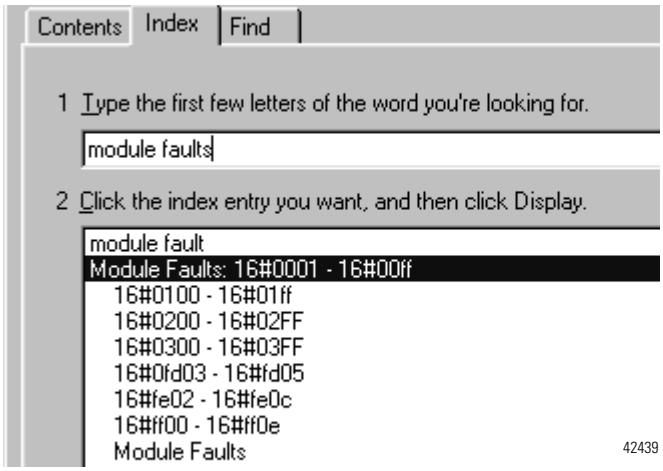
EXAMPLE Address a digital device that is wired to a 1771 I/O module



Validate Connections

Is this task, you verify that the controller can communicate with the devices that you have just configured.

Step:	Detailed actions:	
A. Determine if communications are established.	Is a ⚠ over the I/O Configuration folder?	
	If:	**Then:**
	No	The controller can communicate with the module.
	Yes	Communications are not established. Go to the next step.
B. Identify a fault. Start at the local communication module and work down through the tree.		
C. Identify the fault code.	1. Right-click the module and select *Properties*. 2. Click the *Connection* tab. 3.  42437 3. Identify the code for the fault.	

Step:	Detailed actions:
D. Clear the fault.	1. From the *Help* menu, select *Contents*. 2. Click the *Index* tab. 3. Type *module faults*. **4.**  4. Select the range for the code and click *Display*. 5. Scroll down to your fault code and follow the recommendations.
E. Go to step A.	

Stagger the Messages

As you add messages to your project, you may have to coordinate the execution of the messages. To avoid errors and assure that each message is processed, follow these rules:

Rule 1:	Enable no more than 16 messages at one time (including block transfers).
Rule 2:	Enable no more than 10 of the following types of messages at one time: • CIP data table reads or writes that are *not* cached • CIP generic • PLC2, PLC3, PLC5, or SLC (all types) • block transfer reads or writes that are *not* cached

If the number of messages in your application exceeds rules 1 and 2, then stagger the execution of your messages. Here are some options:

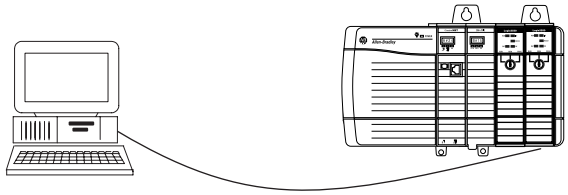
- Send each message in sequence
- Send the messages in groups that are within the limits of rules 1 and 2
- Program a message to communicate with multiple devices. Refer to Read or Write Data To or From Multiple Block Transfer Modules on page 20-15

Download and Go Online over a Serial Cable

When to Use this Procedure

Use this procedure when you want to perform any of the following over a serial cable:

- download a project to a controller
- go online and monitor a controller
- edit a project while it is running in a controller
- save online changes to the offline project file (upload)



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How to Use This Procedure

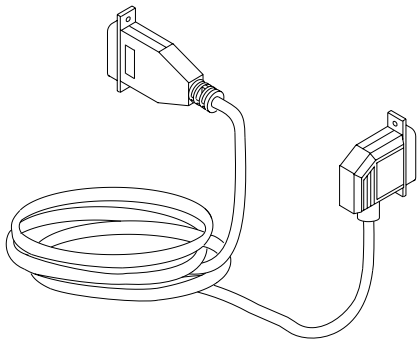
If you have not already done so in a previous procedure, do the following preliminary step:

- Step 1: Connect a Serial Cable

To complete this procedure, do the following steps:

- Step 2: Configure a Serial Driver
- Step 3: Select a Path

Step 1: Connect a Serial Cable

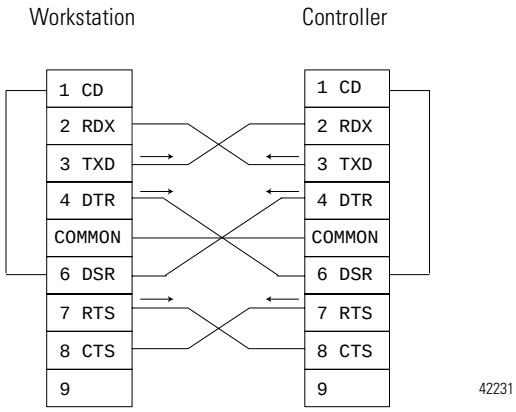


A. Obtain a 1756-CP3 serial cable. (You can also use a 1747-CP3 cable from the SLC product family, but once the cable is connected you cannot close the controller door.)

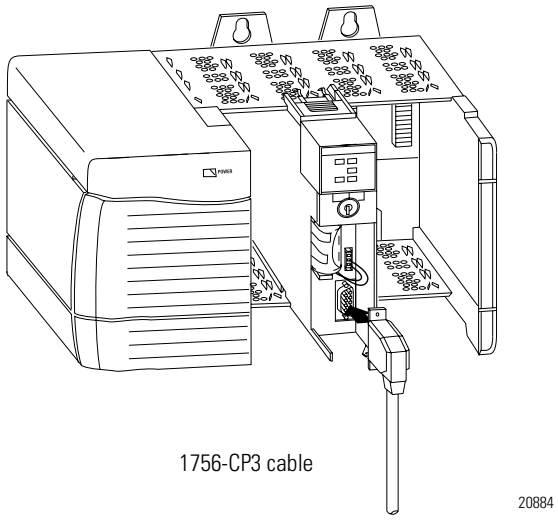
TIP

If you make your own serial cable:

- Limit the length to 15.2m (50 ft).
- Wire the connectors as follows:



- Attach the shield to both connectors.



B. Connect the cable to the controller and to your workstation.

Step 2: Configure a Serial Driver

1. Start RSLinx™ software.

2. From the *Communications* menu, select *Configure Drivers*.

3. From the *Available Driver Types* list, select *RS-232 DF1 Devices*.

4. Click *Add New*.

5. Click *OK* to accept the default name for the driver.

6. From the *Comm Port* drop-down list, select the serial port (on the workstation) that the cable is connected to.

7. From the Device drop-down list, select *Logix 5550-Serial Port*.

8. Click *Auto-Configure*.

9. Does the dialog box display the following message:

Auto Configuration Successful!

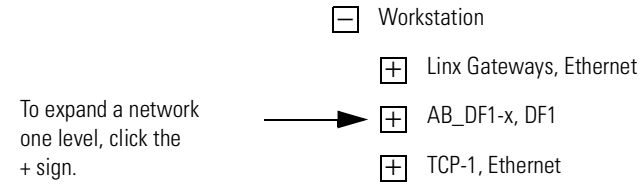
If:	Then:
Yes	Click *OK*.
No	Go to step 6. and verify that you selected the correct Comm Port.

10. Click *Close*.

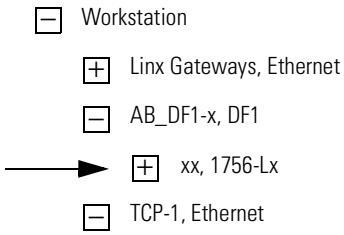
Step 3: Select a Path

A. Open the RSLogix 5000™ project for the controller.

B. From the *Communications* menu, select *Who Active*.



C. Expand the DF1 driver to the level of the controller.



D. Select the controller and choose a button. You may have to confirm the action.

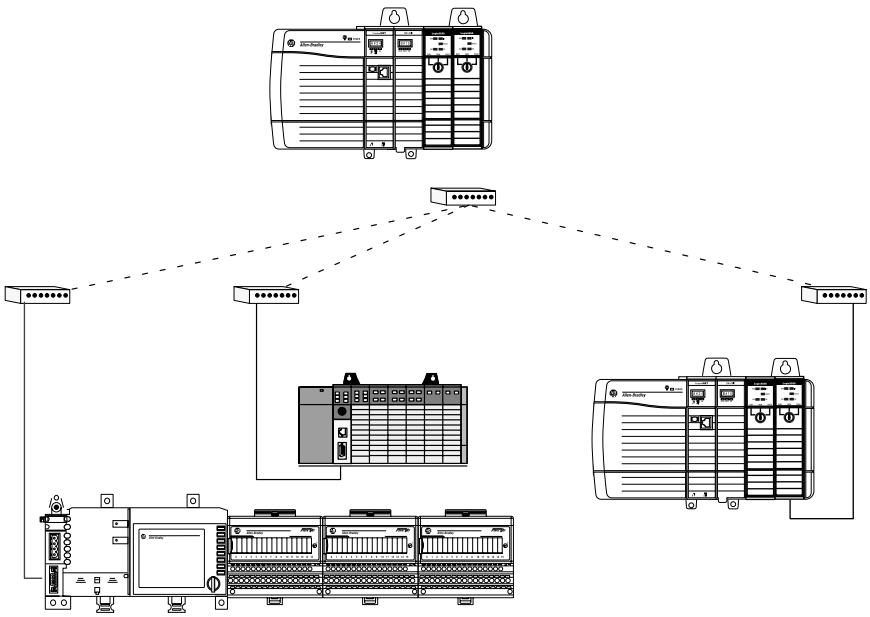
To:	Choose:
monitor the project in the controller	*Go Online*
transfer a copy of the project from the controller to RSLogix 5000 software	*Upload*
transfer the open project to the controller	*Download*

Configure DF1 Master and Slave Communications

When to Use this Procedure

Use this procedure to get information to and from remote controllers (stations) when:

- Your system contains three or more stations.
- Communications occur on a regular basis and require leased-line, radio, or power-line modems.



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How to Use This Procedure

If you have not already done so in a previous procedure, do the following preliminary step:

- Step 1: Connect and Configure the Modems

To complete this procedure, do the following steps:

- Step 2: Select a Polling Mode
- Step 3: Configure the Master Controller for Standard Polling
- Step 4: Configure the Master Controller for Message-Based Polling
- Step 5: Configure a Slave Controller
- Step 6: Enter a Message
- Step 7: Configure the Message
- Step 8: Stagger the Messages

For additional information, see *SCADA System Application Guide*, publication AG-6.5.8.

Step 1: Connect and Configure the Modems

A. Using the following Allen-Bradley cable, connect each controller to the modem:

A-B 1784-CAS, 25-pin male modem connector

The cable has the following wiring:

controller (9-pin female)			modem (25-pin male)
DCD	1	←	8
RXD	2	←	3
TXD	3	→	2
DTR	4	→	20
COMMON	5	—	7
DSR	6	←	6
RTS	7	→	4
CTS	8	←	5

B. Configure the modems.

Step 2: Select a Polling Mode

Determine if you will use standard polling or message-based polling:

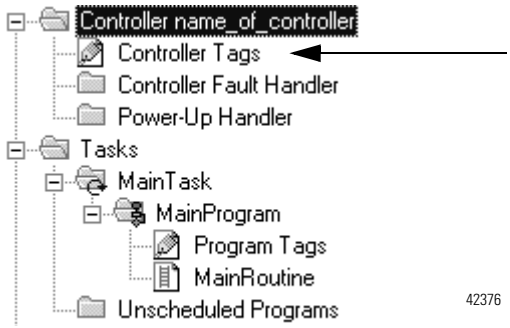
If:	Then go to:	On page:
data is time critical	Step 3: Configure the Master Controller for Standard Polling	22-3
slave controllers will initiate messages		
you want to use logic to control when communication occurs	Step 4: Configure the Master Controller for Message-Based Polling	22-8

Step 3: Configure the Master Controller for Standard Polling

Determine if you must complete this step:

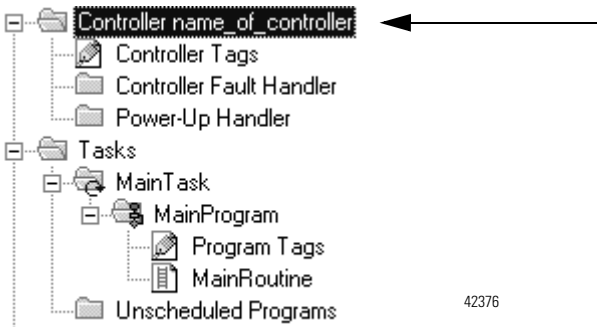
If you are using this polling mode:	Then:
standard	Complete this step
message-based	Go to Step 4: Configure the Master Controller for Message-Based Polling

A. Open the RSLogix 5000™ project.



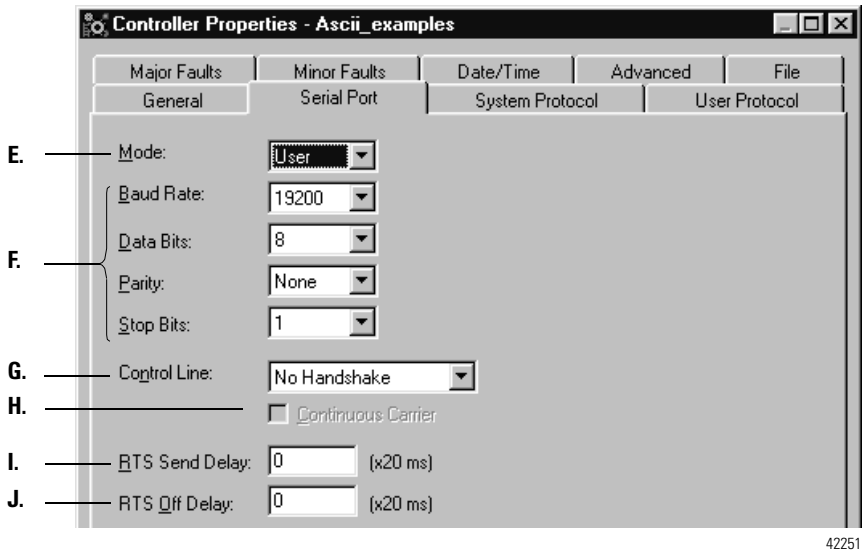
B. Create the following tags:

Scope:	Name:	Data Type:
controller	*list_priority_poll*	DINT*[x]* where: *x* is 2 plus the number of stations that you will poll more frequently than other stations. For example, if you want to poll 5 stations more frequently, create an array of 7 elements.
controller	*list_normal_poll*	DINT*[x]* where: *x* is 2 plus the remaining number of stations. (The stations that you did not include in *list_priority_poll*.)
controller	*list_active_stations*	BOOL[256]



C. Right-click *Controller* `name_of_controller` and select *Properties*.

D. Click the *Serial Port* tab.



E. Select *System* (default).

F. Select the settings for your DF1 network.

G. Select *Half Duplex*.

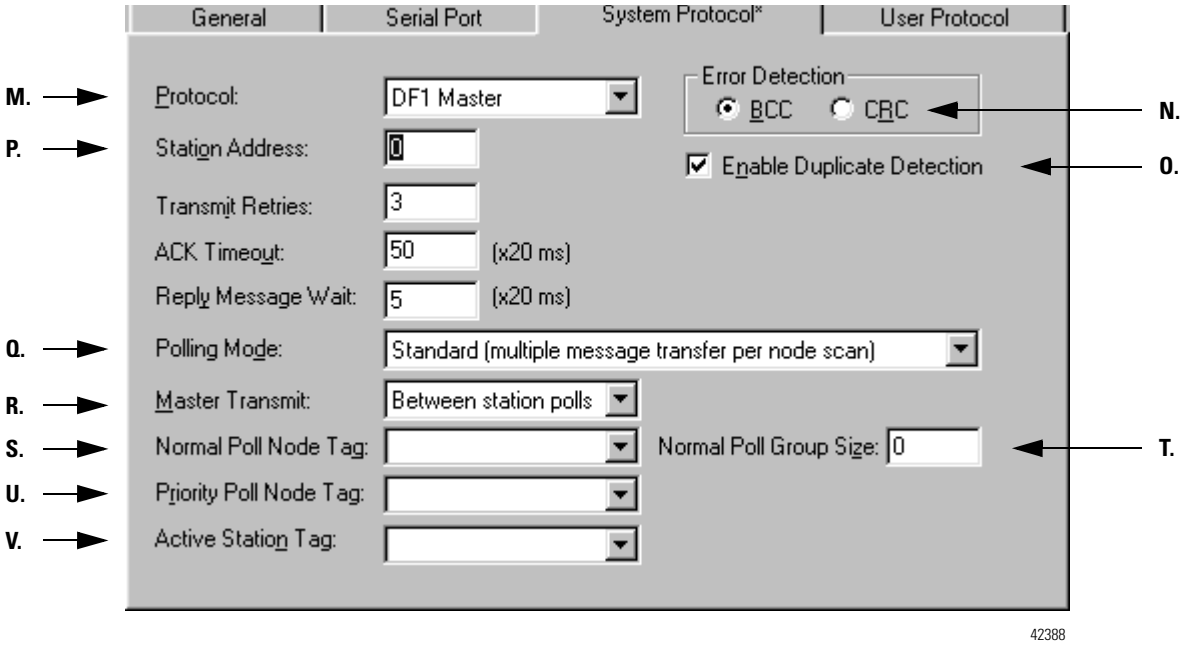
H. Clear (uncheck) the *Continuous Carrier* check box (default).

I. Type the amount of delay (20 ms units) between the time that the RTS signal turns on (high) and the time that data is sent. For example, a value of 4 produces an 80 ms delay.

J. Type the amount of delay (20 ms units) between the time that the last character is sent and the time that the RTS signal turns off (low).

K. Click *Apply*.

L. Click the *System Protocol* tab.



M. Select *DF1 Master*.

N. Select the error detection method that your equipment uses.

O. Do you want to receive duplicate messages?

If:	Then:
Yes	Leave the *Enable Duplicate Detection* selected.
No	Clear the *Enable Duplicate Detection* check box.

P. Type an address between 0 and 254 for this controller.

Q. Is it critical to keep the poll list scan time to a minimum?

If:	Then select:
No	*Standard (multiple message transfer per node scan)*
Yes	*Standard (single message transfer per node scan)*

R. Determine when the master controller should send its messages:

To send messages to slave stations:	Select:
before polling the next station	*Between station polls*
when the station number of the master appears in the polling lists	*In polling sequence*

S. Select the `list_normal_poll` tag (step B.)

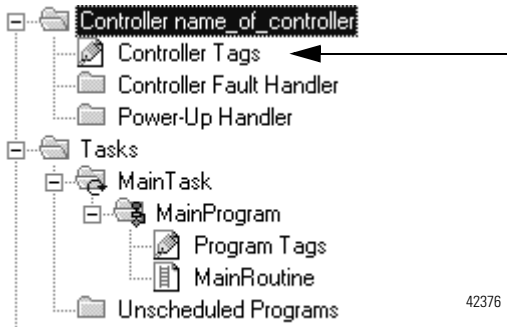
T. After polling the priority stations, how many normal stations do you want to poll?

If:	Then:
all	Leave the default of 0.
not all	Type the number to poll before returning to the priority stations.

U. Select the `list_priority_poll` tag (step B.)

V. Select the `list_active_stations` tag (step B.)

W. Click *OK*.



X. Double-click *Controller Tags*.

Y. In the *list_priority_poll* tag (step B.), enter the addresses of the priority stations to poll:

- If this controller (master) sends its messages in the polling sequence (step R.), include this controller in the list.
- Enter the addresses in the order that you want them polled.

Tag Name	Value
⊟ *list_priority_poll*	{ ... }
⊞ *list_priority_poll* [0]	total number of priority stations
⊞ *list_priority_poll* [1]	leave blank
⊞ *list_priority_poll* [2]	address of the first station to poll
⊞ *list_priority_poll* [3]	address of the second station to poll
⊞ *list_priority_poll* [...]	address of the next station to poll

Z. In the *list_normal_poll* tag (step B.), enter the addresses of the normal stations to poll.

- If this controller (master) sends its messages in the polling sequence (step R.), include this controller in the list.
- Enter the addresses in the order that you want them polled.

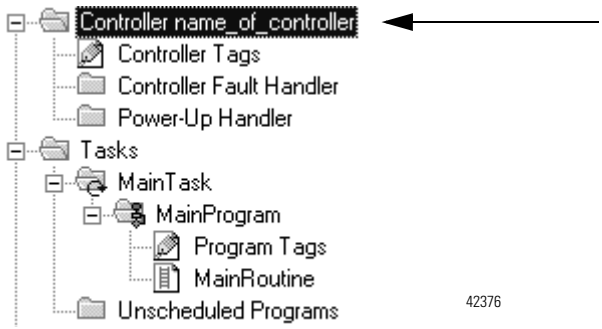
Tag Name	Value
⊟ *list_normal_poll*	{ ... }
⊞ *list_normal_poll* [0]	total number of normal stations
⊞ *list_normal_poll* [1]	leave blank
⊞ *list_normal_poll* [2]	address of the first station to poll
⊞ *list_normal_poll* [3]	address of the second station to poll
⊞ *list_normal_poll* [...]	address of the next station to poll

Step 4: Configure the Master Controller for Message-Based Polling

Determine if you must complete this step:

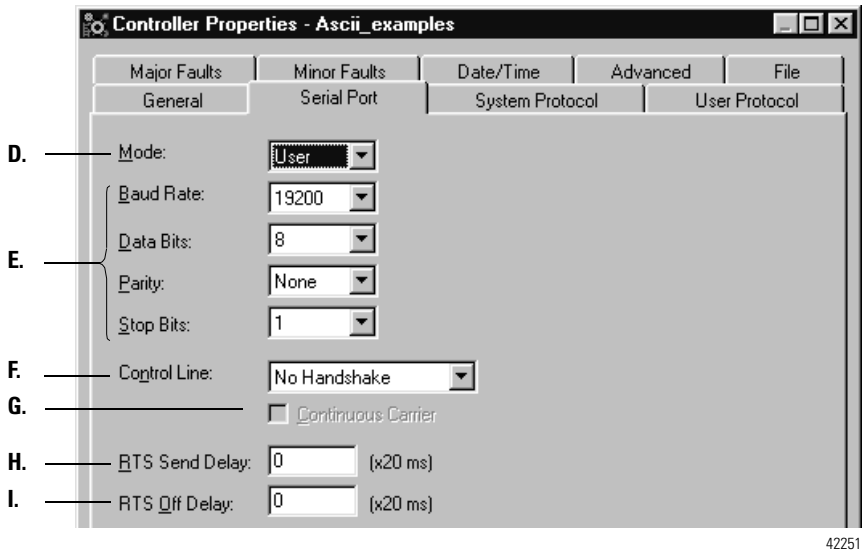
If you are using this polling mode:	Then:
standard	Go to Step 5: Configure a Slave Controller
message-based	Complete this step

A. Open the RSLogix 5000 project.



B. Right-click *Controller* `name_of_controller` and select *Properties*.

C. Click the *Serial Port* tab.



D. Select *System* (default).

E. Select the settings for your DF1 network.

F. Select *Half Duplex*.

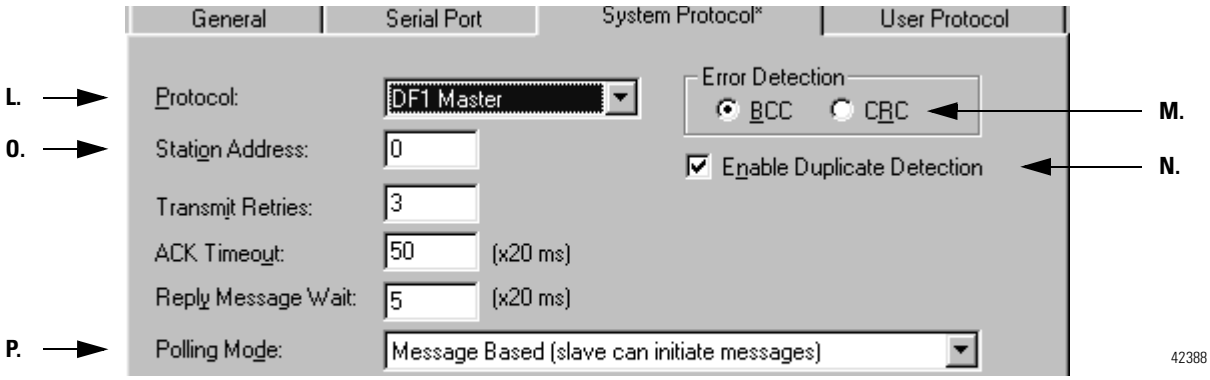
G. Clear (uncheck) the *Continuous Carrier* check box (default).

H. Type the amount of delay (20 ms units) between the time that the RTS signal turns on (high) and the time that data is sent. For example, a value of 4 produces an 80 ms delay.

I. Type the amount of delay (20 ms units) between the time that the last character is sent and the time that the RTS signal turns off (low).

J. Click *Apply*.

K. Click the *System Protocol* tab.



L. Select *DF1 Master*.

M. Select the error detection method that your equipment uses.

N. Do you want to receive duplicate messages?

If:	Then:
Yes	Leave the *Enable Duplicate Detection* selected.
No	Clear the *Enable Duplicate Detection* check box.

O. Type an address between 0 and 254 for this controller.

P. Do you want to ignore messages from slave stations?

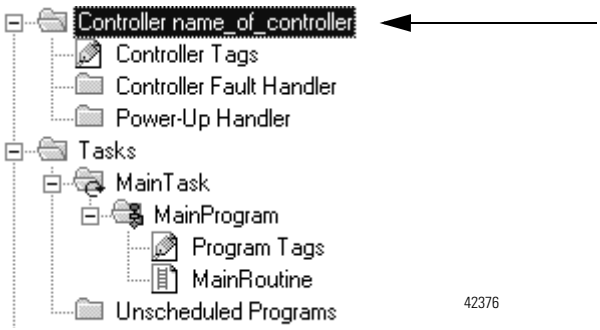
If:	Then select:
No	*Message Based (slave can initiate messages)*
Yes	*Message Based (slave cannot initiate messages)*

A slave station can only send a message when it receives a message from this controller (master).

Q. Click *OK*.

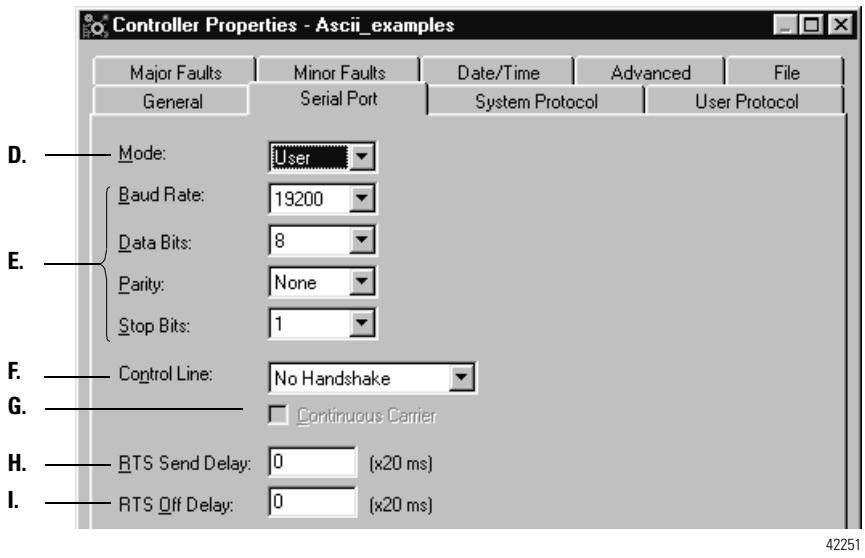
Step 5: Configure a Slave Controller

A. Open the RSLogix 5000 project for the slave controller.



B. Right-click *Controller* `name_of_controller` and select *Properties*.

C. Click the *Serial Port* tab.



D. Select *System* (default).

E. Select the settings for your DF1 network.

F. Select *Half Duplex*.

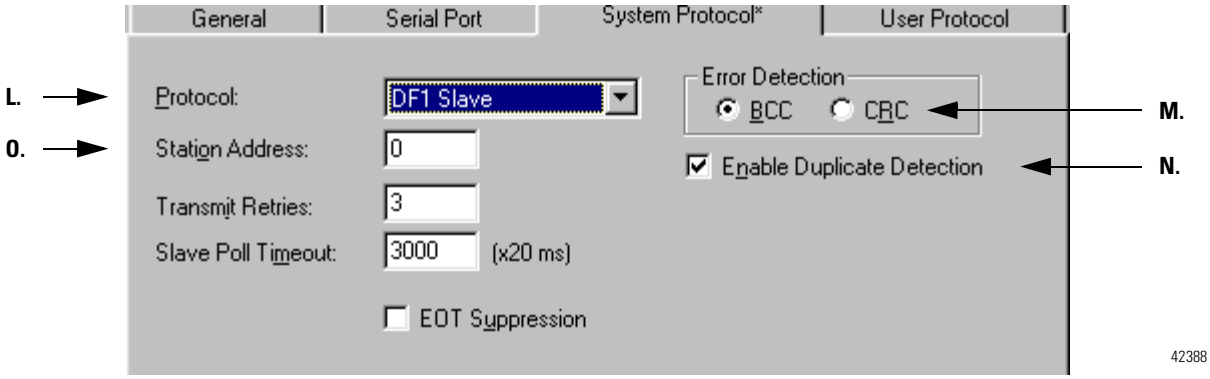
G. Clear (uncheck) the *Continuous Carrier* check box (default).

H. Type the amount of delay (20 ms units) between the time that the RTS signal turns on (high) and the time that data is sent. For example, a value of 4 produces an 80 ms delay.

I. Type the amount of delay (20 ms units) between the time that the last character is sent and the time that the RTS signal turns off (low).

J. Click *Apply*.

K. Click the *System Protocol* tab.



L. Select *DF1 Slave*.

M. Select the error detection method that your equipment uses.

N. Do you want to receive duplicate messages?

If:	Then:
Yes	Leave the *Enable Duplicate Detection* selected.
No	Clear the *Enable Duplicate Detection* check box.

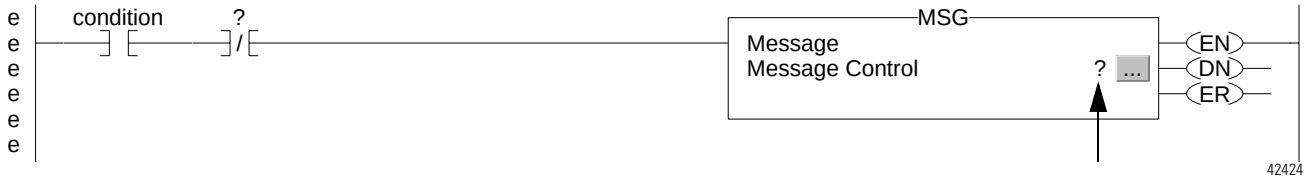
O. Type an address between 0 and 254 for this controller.

P. Click *OK*.

Step 6: Enter a Message

Regardless of whether you use standard polling or message-based polling, you must use a MSG instruction to transfer data between controllers:

A. Enter a MSG instruction and associated input instruction (s).



B. In the MSG instruction, type a name for the message control tag and press the *Enter* key.

C. In the MSG instruction, right-click the message control tag and select *New* `tag_name.` (In older revisions of the software, the menu option is *Create* `tag_name.`)

D. From the *Scope* list, select `name_of_controller`*(controller)*, and click *OK*.

E. Enter `message.`EN.

where:

`message` is the message control tag from step B.

F. If your message is to a PLC-5® or SLC 500™ controller *and* it reads or writes integers (not REALs), use a buffer of INTs in the message.

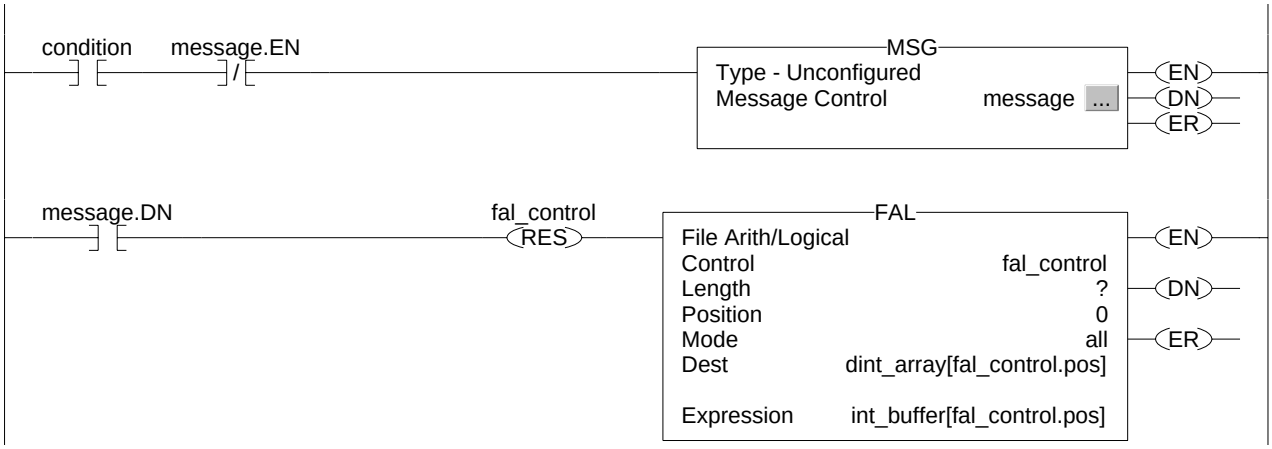
- ControlLogix controllers execute more efficiently and use less memory when working with 32-bit integers (DINTs). Use the DINT data type for integers whenever possible.
- PLC-5 and SLC 500 controllers require 16-bit integers.
- Use an INT buffer in the message and move the data into or out of the buffer as required.

The following examples show how to use a buffer of INTs

EXAMPLE

Read integers from a PLC-5 controller

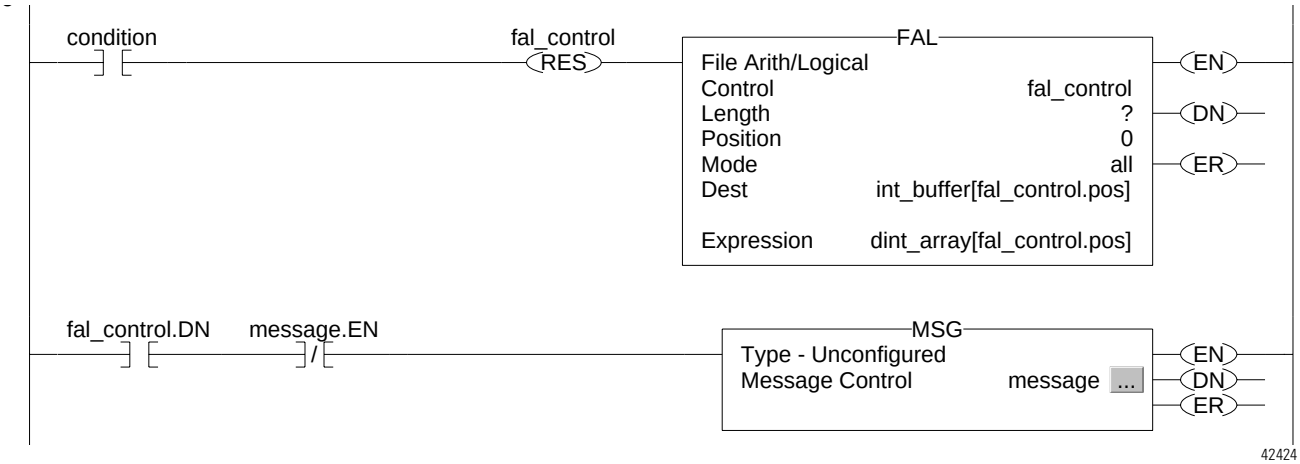
When *condition* turns on, reads 16-bit integer values (INTs) and stores them in *int_buffer*. Then the FAL instruction moves the values to *dint_array*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the ControlLogix controller.



EXAMPLE

Write integers to a PLC-5 controller

When *condition* turns on, moves the values in *dint_array* to *int_buffer*. This converts the values to 16-bit integers (INTs). Then the message instruction sends *int_buffer* to the other controller.



Where:	Is an:
dint_array	array of DINTs that are used in the ControlLogix controller
int_buffer	array of INTs with the same number of elements as *dint_array*

Step 7: Configure the Message

A. In the MSG instruction, click ... .

B. Select a configuration for the message:

Table 22.A Message to a ControlLogix or FlexLogix controller

If the data is:	And you want to:	For this item:	Type or select:
structure (s)	read (receive) the data	Message Type	*CIP Data Table Read*
		Source Element	first element of the tag that contains data in the other controller
		Number Of Elements	number of elements to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) the data	Message Type	*CIP Data Table Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of elements to transfer
		Destination Element	first element of the tag for the data in the other controller
not structure (s)	read (receive) the data	Message Type	*PLC5 Typed Read*
		Source Element	*@name* where: *name* is the first element of the tag that contains data in the other controller.
		Number Of Elements	number of elements to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) the data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of elements to transfer
		Destination Element	*@name* where: *name* is the first element of the tag for the data in the other controller.

Table 22.B Message to a PLC-5 controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., F8:0)

Table 22.C Message to a SLC 500 controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., F8:0)

C. Click the *Communication* tab.

D. In the Path box, type the following path:

2, `station_address`

where:

`station_address` is the DF1 address of the controller that is receiving the message.

E. Leave the communication method at the default settings of:

- *CIP*
- *Cache Connections* (This check box does not apply to messages from the serial port.)

F. Click *OK*.

Step 8: Stagger the Messages

As you add messages to your project, you may have to coordinate the execution of the messages. To avoid errors and assure that each message is processed, follow these rules:

Rule 1:	Enable no more than 16 messages at one time (including block transfers).
Rule 2:	Enable no more than 10 of the following types of messages at one time: • CIP data table reads or writes that are *not* cached • CIP generic • PLC2, PLC3, PLC5, or SLC (all types) • block transfer reads or writes that are *not* cached

If the number of messages in your application exceeds rules 1 and 2, then stagger the execution of your messages. Here are some options:

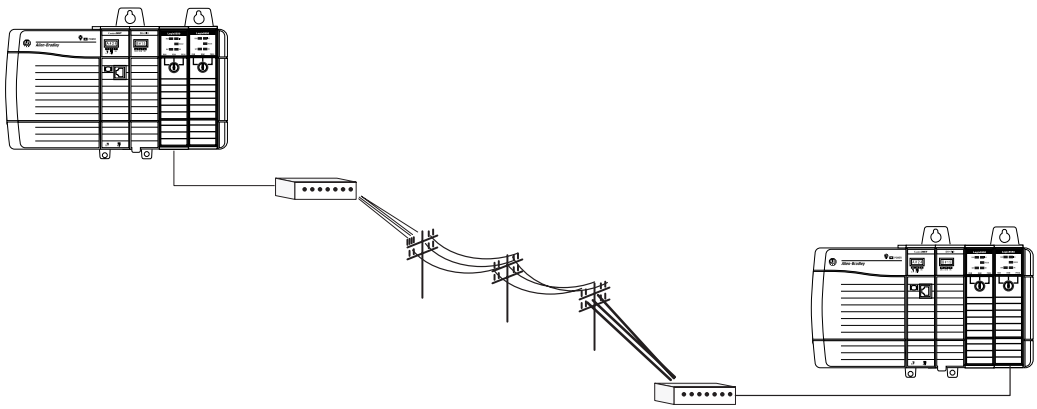
- Send each message in sequence
- Send the messages in groups that are within the limits of rules 1 and 2

Notes:

Configure Dial-Up Communications

When to Use this Procedure

Use this procedure to send a message to another controller over a public telephone line.



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How to Use This Procedure

If you have not already done so in a previous procedure, do the following preliminary step:

- Step 1: Connect and Configure the Modems

To complete this procedure, do the following steps:

- Step 2: Configure the Serial Port of the Controller
- Step 3: Dial the Other Controller
- Step 4: Send the Message
- Step 5: Configure the Message
- Step 6: Hang-Up
- Step 7: Stagger the Messages

For additional information, see *SCADA System Application Guide*, publication AG-6.5.8.

Step 1: Connect and Configure the Modems

A. Connect each controller to the modem using the following Allen-Bradley cable:

A-B 1784-CAS, 25-pin male modem connector

The cable has the following wiring:

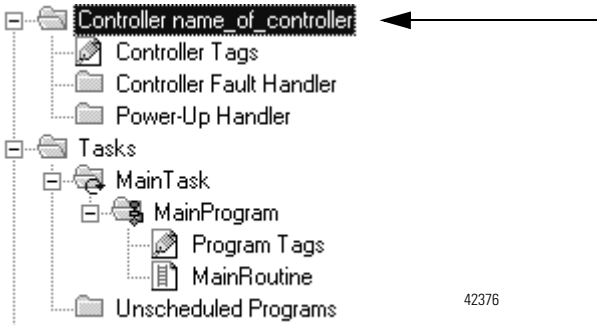
controller (9-pin female)			modem (25-pin male)
DCD	1	←	8
RXD	2	←	3
TXD	3	→	2
DTR	4	→	20
COMMON	5	—	7
DSR	6	←	6
RTS	7	→	4
CTS	8	←	5

B. Configure the modems:

Configure this signal:	To:
DSR	be on (high) when a modem connection exists
DCD (CD)	be on (high) whenever the modem receives the carrier from the remote modem
DTR	hang-up when the controller changes the DTR signal from on to off (E.g., Set DTR to normal, not override.)

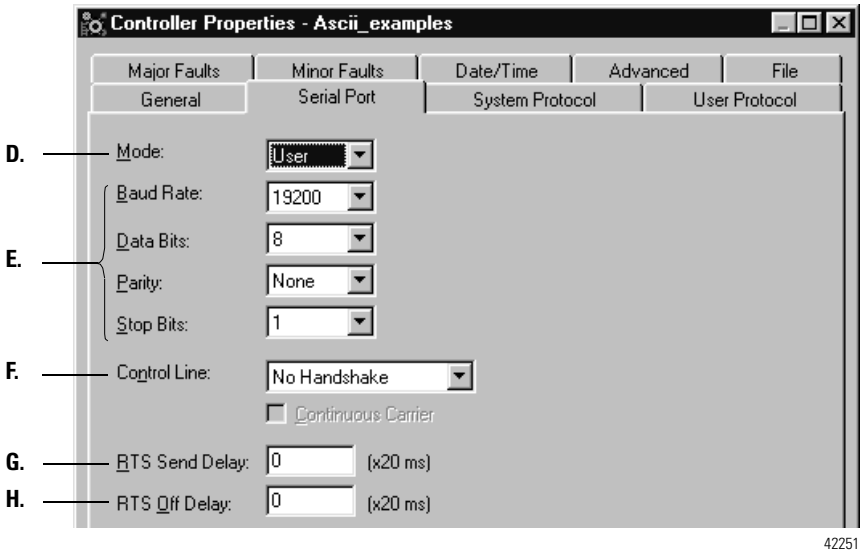
Step 2: Configure the Serial Port of the Controller

A. Open the RSLogix 5000™ project for the controller.



B. Right-click *Controller* `name_of_controller` and select *Properties*.

C. Click the *Serial Port* tab.



D. Select *System* (default).

E. Select the settings for your DF1 network.

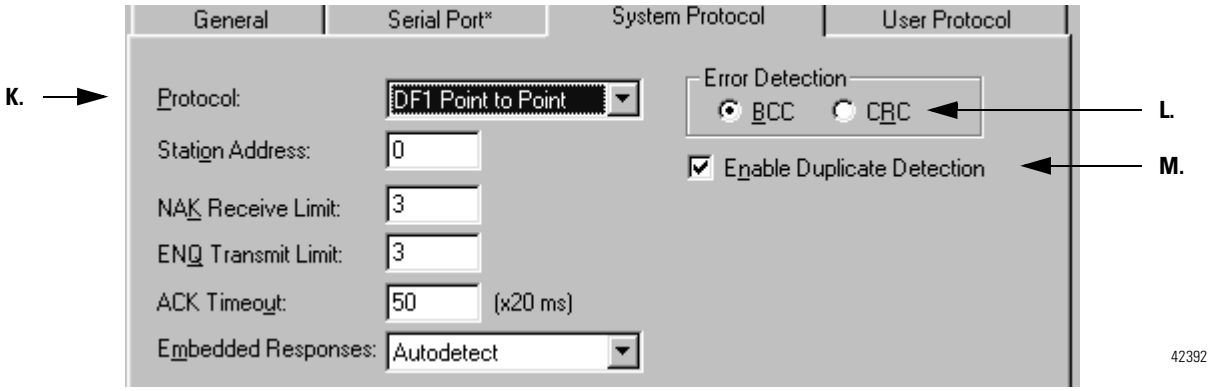
F. Select *Full Duplex*.

G. Type the amount of delay (20 ms units) between the time that the RTS signal turns on (high) and the time that data is sent. For example, a value of 4 produces an 80 ms delay.

H. Type the amount of delay (20 ms units) between the time that the last character is sent and the time that the RTS signal turns off (low).

I. Click *Apply*.

J. Click the *System Protocol* tab.



K. Select *DF1 Point to Point* (Default).

L. Select the error detection method that your equipment uses.

M. Do you want to receive duplicate messages?

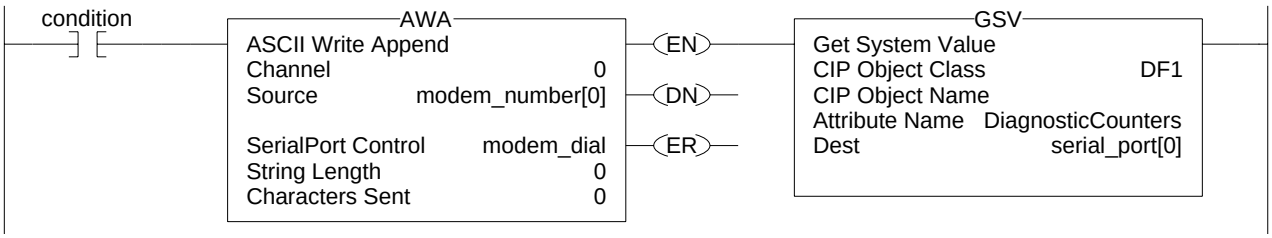
If:	Then:
Yes	Leave the *Enable Duplicate Detection* selected.
No	Clear the *Enable Duplicate Detection* check box.

N. Click *OK*.

Step 3: Dial the Other Controller

Use the following logic to dial another controller:

When *condition* turns on, the AWA instruction commands the modem to dial a remote controller. The GSV instruction monitors the status of the serial port.

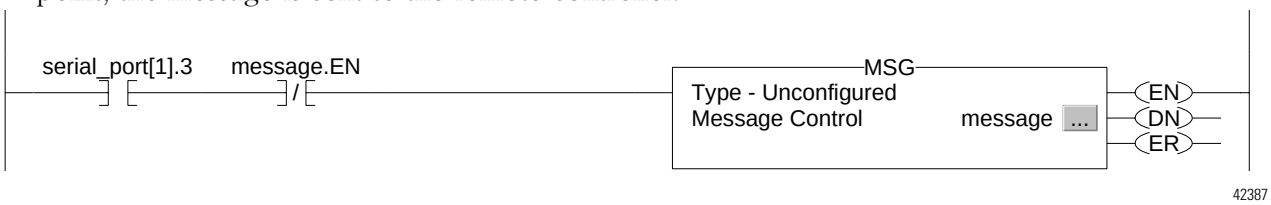


Where:	Is:
condition	condition in your that initiates the dial-up sequence
modem_number	array of SINTs that contains the string of ASCII characters that tell the modem to dial a specific telephone number
String Length	0, which means to send all the characters in *modem_number*
serial_port	array of 19 INTs (INT[19]) that stores the status of the serial port

Step 4: Send the Message

A. Enter the following logic:

Serial_port [1] contains the status of the modem signals. When bit 3 is on (DCD is high), the modem is receiving the carrier from the remote modem and communication is established. At this point, the message is sent to the remote controller.



Where:	Is:
serial_port	array of 19 INTs (INT[19]) that stores the status of the serial port
message	tag that controls the execution of the message (MESSAGE data type)

B. If your message is to a PLC-5® or SLC 500™ controller *and* it reads or writes integers (not REALs), use a buffer of INTs in the message.

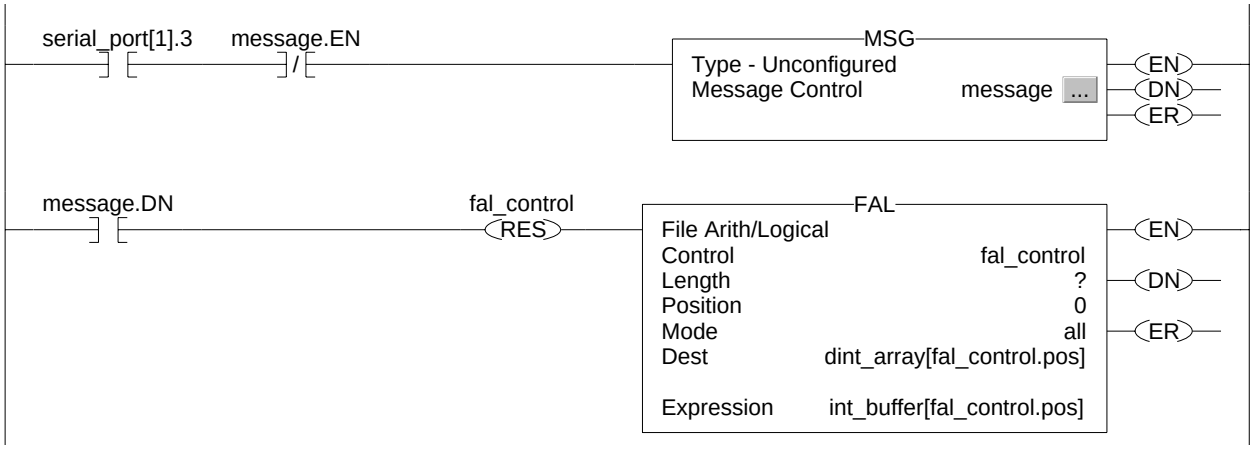
- ControlLogix controllers execute more efficiently and use less memory when working with 32-bit integers (DINTs). Use the DINT data type for integers whenever possible.
- PLC-5 and SLC 500 controllers require 16-bit integers.
- Use an INT buffer in the message and move the data into or out of the buffer as required.

The following examples show how to use a buffer of INTs

EXAMPLE

Read integers from a PLC-5 controller

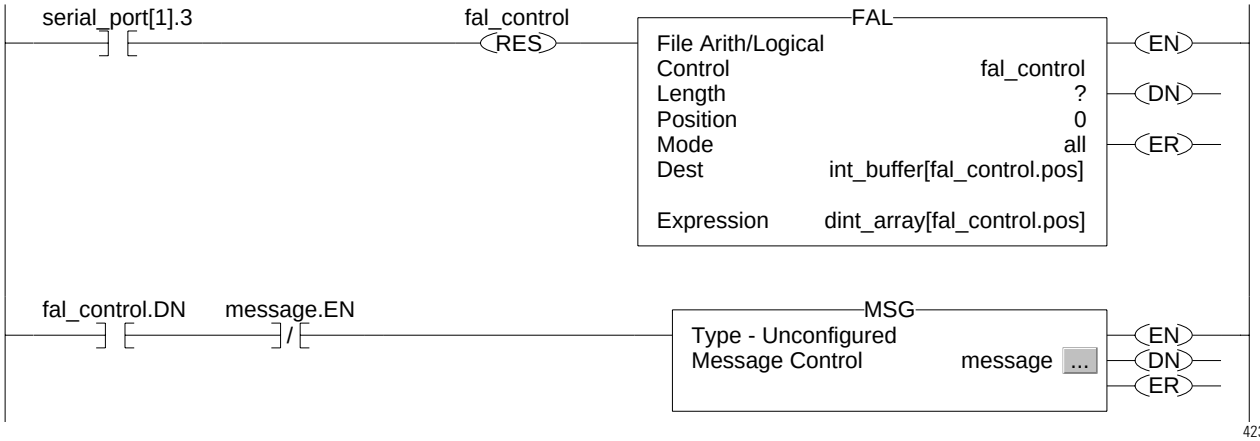
When *serial_port[1].3* turns on, reads 16-bit integer values (INTs) and stores them in *int_buffer*. Then the FAL instruction moves the values to *dint_array*. This converts the values to 32-bit integers (DINTs), for use by other instructions in the ControlLogix controller.



EXAMPLE

Write integers to a PLC-5 controller

When *serial_port[1].3* turns on, moves the values in *dint_array* to *int_buffer*. This converts the values to 16-bit integers (INTs). Then the message instruction sends *int_buffer* to the other controller.



Where:	Is an:
dint_array	array of DINTs that are used in the ControlLogix controller
int_buffer	array of INTs with the same number of elements as *dint_array*

Step 5: Configure the Message

A. In the MSG instruction, click ... .

B. Select a configuration for the message:

Table 23.A Message to a ControlLogix or FlexLogix controller

If the data is:	And you want to:	For this item:	Type or select:
structure (s)	read (receive) the data	Message Type	*CIP Data Table Read*
		Source Element	first element of the tag that contains data in the other controller
		Number Of Elements	number of elements to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) the data	Message Type	*CIP Data Table Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of elements to transfer
		Destination Element	first element of the tag for the data in the other controller
not structure (s)	read (receive) the data	Message Type	*PLC5 Typed Read*
		Source Element	*@name* where: *name* is the first element of the tag that contains data in the other controller.
		Number Of Elements	number of elements to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) the data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of elements to transfer
		Destination Element	*@name* where: *name* is the first element of the tag for the data in the other controller.

Table 23.B Message to a PLC-5 controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*PLC5 Typed Read*
		Source Element	data table address in the PLC-5 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*PLC5 Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the PLC-5 controller (e.g., F8:0)

Table 23.C Message to a SLC 500 controller

If the data is:	And you want to:	For this item:	Type or select:
integer (s)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., N7:10)
		Number Of Elements	number of integers to transfer
		Destination Tag	first element of `int_buffer`
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of `int_buffer`
		Number Of Elements	number of integers to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., N7:10)
floating-point (REAL)	read (receive) data	Message Type	*SLC Typed Read*
		Source Element	data table address in the SLC 500 controller (e.g., F8:0)
		Number Of Elements	number of values to transfer
		Destination Tag	first element of the tag (controller-scoped) in this controller for the data
	write (send) data	Message Type	*SLC Typed Write*
		Source Tag	first element of the tag (controller-scoped) in this controller that contains the data
		Number Of Elements	number of values to transfer
		Destination Element	data table address in the SLC 500 controller (e.g., F8:0)

C. Click the *Communication* tab.

D. In the Path box, type the following path:

```
2,0
```

Since dial-up communications are point-to-point, the actual address of the controller is not required.

E. Leave the communication method at the default settings of:

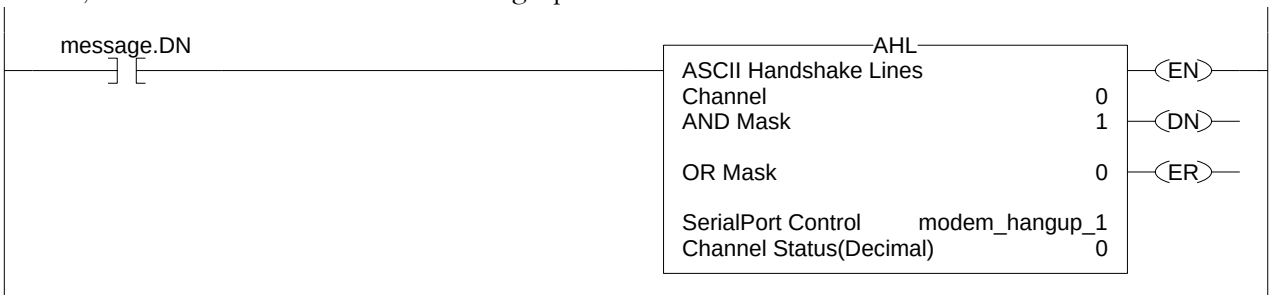
- *CIP*
- *Cache Connections* (This check box does not apply to messages from the serial port.)

F. Click *OK*.

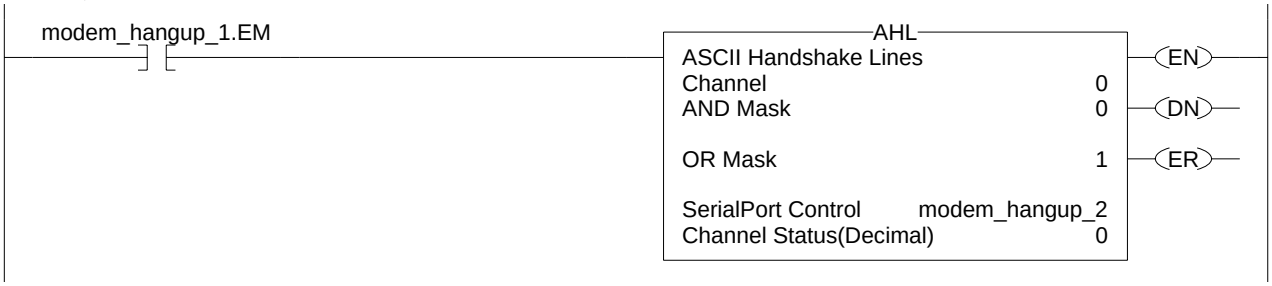
Step 6: Hang-Up

Enter the following logic to hang-up:

After the remote controller receives the message (*message .DN* is on), the AHL turns off the DTR line, which causes the modem to hang up.



After the modem hangs up (*modem_hangup_1 .EM* is on), the AHL instruction turns on the DTR line, which readies the modem for the next call.



42393

Where:	Is:
message	tag that controls the execution of the message (MESSAGE data type)
modem_hangup_1	tag that controls the execution of the AHL (SERIAL_PORT_CONTROL data type)
modem_hangup_2	tag that controls the execution of the AHL (SERIAL_PORT_CONTROL data type)

Step 7: Stagger the Messages

As you add messages to your project, you may have to coordinate the execution of the messages. To avoid errors and assure that each message is processed, follow these rules:

Rule 1:	Enable no more than 16 messages at one time (including block transfers).
Rule 2:	Enable no more than 10 of the following types of messages at one time: • CIP data table reads or writes that are *not* cached • CIP generic • PLC2, PLC3, PLC5, or SLC (all types) • block transfer reads or writes that are *not* cached

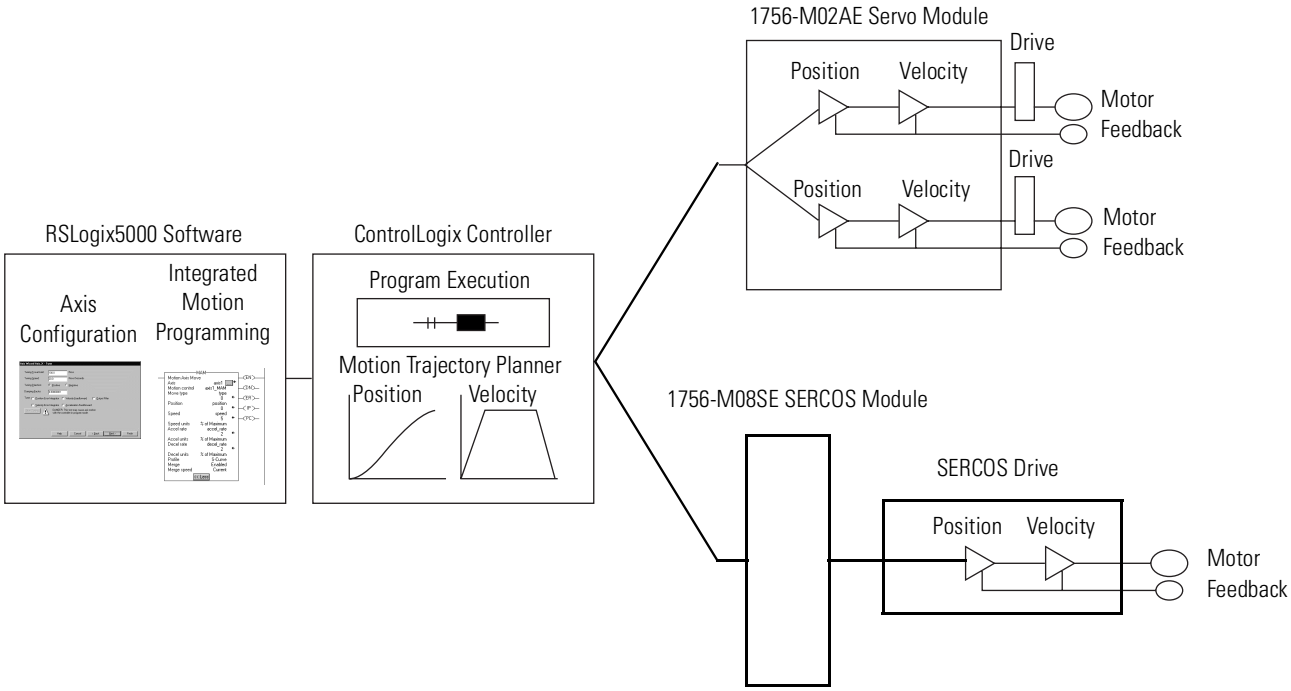
If the number of messages in your application exceeds rules 1 and 2, then stagger the execution of your messages. Here are some options:

- Send each message in sequence
- Send the messages in groups that are within the limits of rules 1 and 2

Program Motion Control

When to Use This Procedure

The ControlLogix controller, 1756-M02AE servo module or 1756-M08SE SERCOS module, and RSLogix 5000™ software create an integrated motion control system.



- The ControlLogix controller contains a high-speed motion task, which executes motion requests from the routines and generates position and velocity profile information. Each ControlLogix controller controls up to 16 1756-M02AE or 1756-M08SE modules.
- The 1756-M02AE servo module connects to a servo drive and closes a high-speed position and velocity loop. Each 1756-M02AE module controls up to two axes.
- The 1756-M08SE SERCOS module connects to one or more SERCOS drives and controls up to 8 axes. Each SERCOS drive closes a high-speed position and velocity loop.
- RSLogix 5000 software provides complete axis configuration and motion programming support.

How to Use This Procedure

To program motion control:

- Select a CST Master Device
- Add the Motion Module
- 1756-M08SE - Add the SERCOS Drive
- Create a Motion Group
- Assign the Properties of the Motion Group
- Configure the Axis
- Run Hookup Tests
- Develop Logic for Motion Control

For more information, see the *ControlLogix Motion Module Setup and Configuration Manual*, publication 1756-UM006.

Select a CST Master Device

If your controller uses a motion axis, you must define a device in the chassis as a coordinated system time (CST) master. This synchronizes all servo modules and controllers in the chassis to the same system clock.

IMPORTANT Only one device in a chassis can be the CST master.

You have the following options:

- Define the Controller as the CST Master

  or

- Define a 1756-SYNCH Module as the CST Master

Define the Controller as the CST Master

1. In the controller organizer, right-click the Controller folder and select *Properties*.
2. Click the *Date/Time* tab.
3. Is another controller in the chassis the CST master?

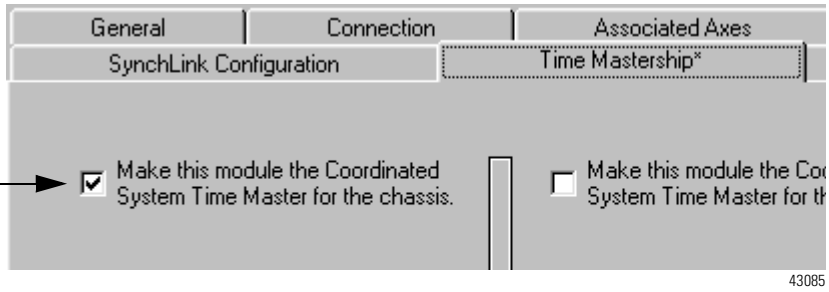
If:	Then:
No	Select the *Make this controller the master* check box.
Yes	Clear the *Make this controller the master* check box.

4. Click *OK*.

Define a 1756-SYNCH Module as the CST Master

1. In the controller organizer, right-click the 1756-SYNCH module and choose *Properties*.
2. Click the *Time Mastership* tab.

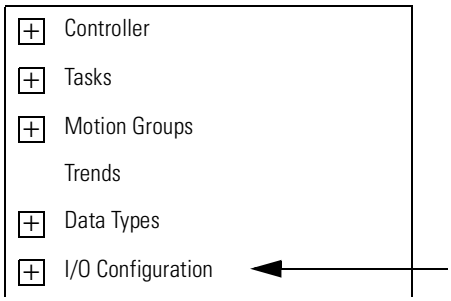
3. Select this check box.



4. Choose *OK*.

Add the Motion Module

1. Open the RSLogix 5000™ project offline.



1. Right-click and select *New Module*.

2. Select the your type of motion module and choose *OK*.

3. Type a name for the module.

4. Type or select the slot number where the module is installed

5. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

6. Choose *Next*.

7. Initially, do you want to the module to communicate with the controller?

If:	Then:
Yes	Leave the check box cleared (unchecked).
No	Select the check box.

EXAMPLE

Inhibit a module

Use the Inhibit Module check box to make it easier to test a system:

- Initially, inhibit the module.
- When you are ready to test the devices that are associated with the module, clear the check box.

8. If communication with the module fails, how do you want the controller to respond?

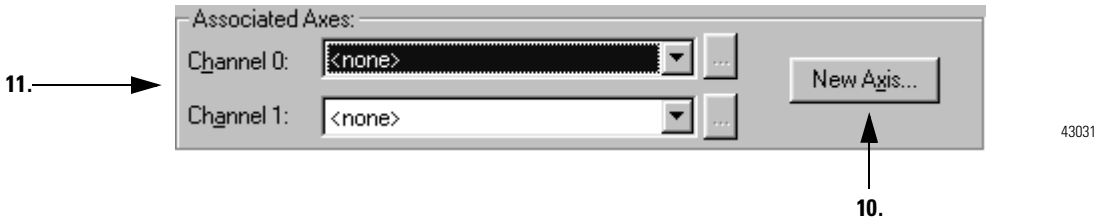
ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

9. Choose *Next*.

1756-M02AE



10. Choose *New Axis*.

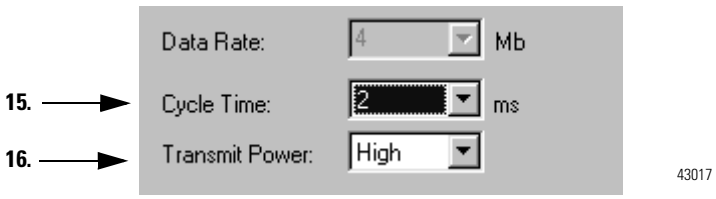
11. Type a name for the axis and choose *OK*.

12. Assign the axis to a channel (the physical connection on the servo module to which the axis is wired).

13. Repeat steps 10 - 12 for the other channel, if required.

14. Choose *Finish*.

1756-M08SE



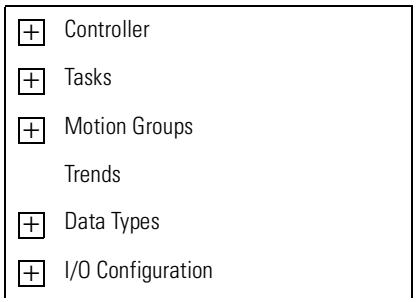
15. How many axes are connected to this module? (In the next section, you associate the axes with the module.)

If this number of axes:	Then select a Cycle Time of:
1 - 4	1
5 - 8	2

16. Select the intensity of the light beam on the fiber optic cable. For cables that span long distances or cables that are low quality, select *High*.

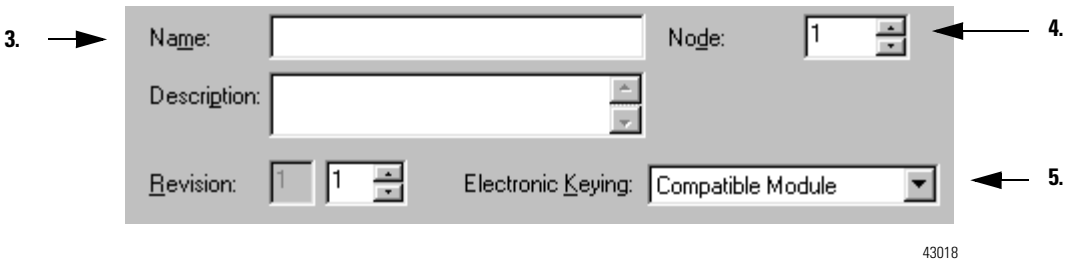
17. Choose *Finish*.

1756-M08SE - Add the SERCOS Drive



1. Right-click and select *New Module*.

2. Select the SERCOS drive and choose *OK*.



3. Type a name for the drive.

4. Type or select the node number of the drive. If this is a multi-axis drive, select the node number of the first axis.

5. How closely must any module in this slot match the information on this tab?

If this information must match:	Then select
all, including minor revision number	*Exact Match*
all *except* the minor revision number	*Compatible Module*
none	*Disable Keying*

6. Choose *Next*.

7. If communication with the module fails, how do you want the controller to respond?

ATTENTION

If communication with a module fails, the controller operates on old data from the module. To avoid potential injury or damage, either monitor communications with modules or configure modules to produce a major fault if communications fail.

If you want the controller to:	Then:	Notes:
fault (major fault)	Select the check box.	
continue operating	Leave the check box cleared (unchecked).	Monitor the connection using ladder logic.

8. Choose *Next*.

9. Choose New Axis.

10. Type a name for the tag for this node (axis) and choose *OK*.

11. Select the name of the tag from step 10.

12. If this is a multi-axis drive, repeat steps 9 - 11 for each axis.

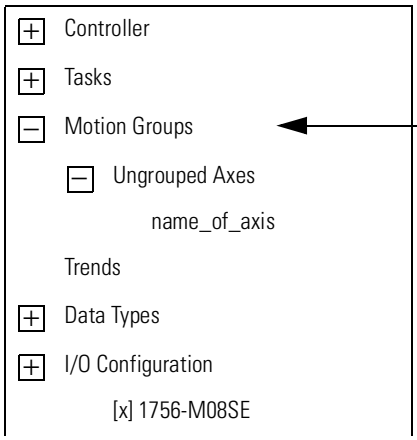
13. Choose *Next*.

14. Which type of bus regulator does this drive use?

If:	Then select:
external	catalog number of the regulator
internal	Internal
none	<none>

15. Choose *Finish*.

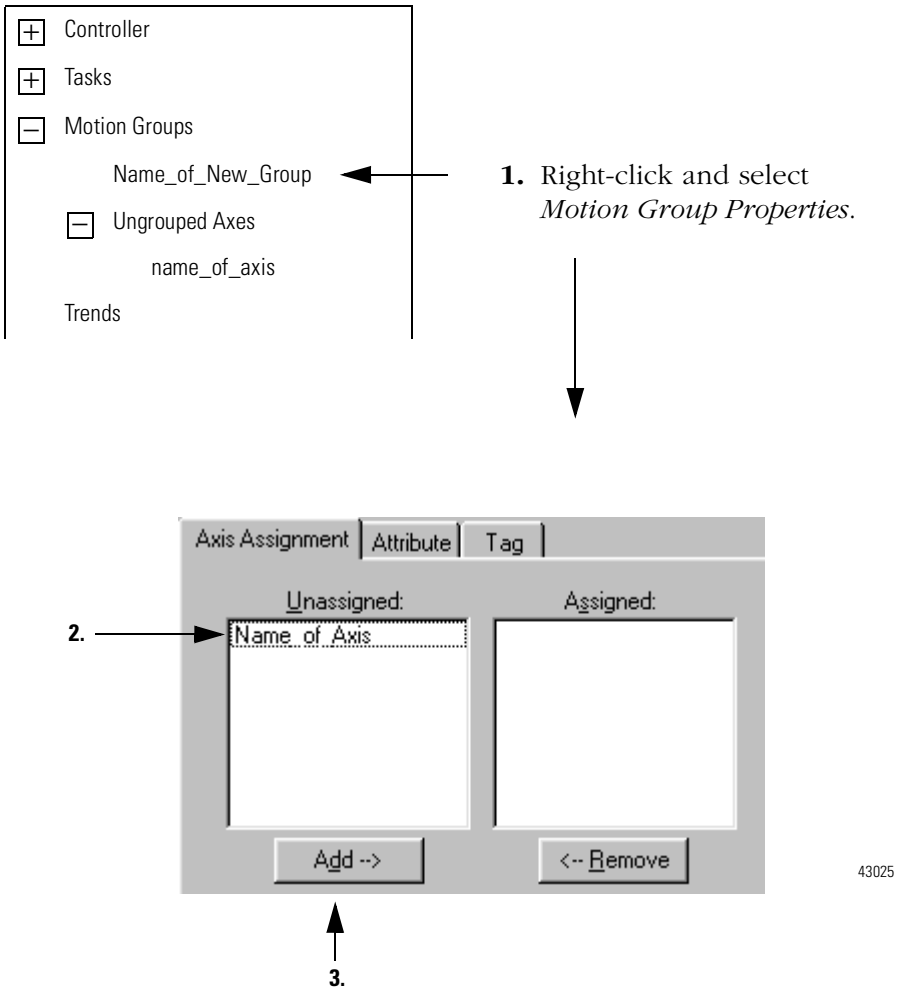
Create a Motion Group



1. Right-click and select *New Motion Group*.

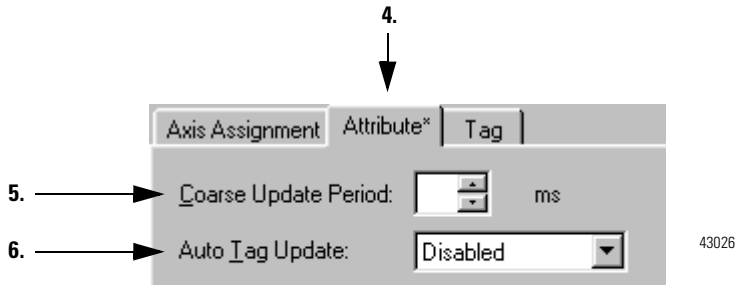
2. Type a name for the group and choose *OK*.

Assign the Properties of the Motion Group



2. Select the axis.

3. Choose *Add* -->.



4. Click the *Attribute* tab.

5. Type or select the rate at which you want the controller to update the axes that are assigned to this group.

- For a 1756-M08SE module, set the *Coarse Update Period* to a multiple of the *Cycle Time*.

6. Do you want to monitor any of the following members of an axis of this group directly via its tag? (A GSV instruction always lets you access these values regardless of this selection.)

- ActualAcceleration
- ActualPosition
- ActualVelocity
- AverageVelocity
- CommandAcceleration
- CommandPosition
- CommandVelocity
- MasterOffset

If:	Then select:	Notes:
Yes	Enabled	This increases the motion execution time of the controller. Refer to Estimate Execution Time of a Motion Action on page B-28.
No	Disabled	

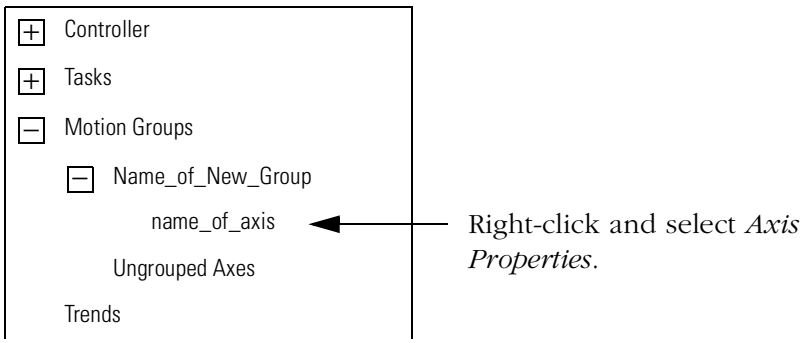
7. Choose *OK*.

Configure the Axis

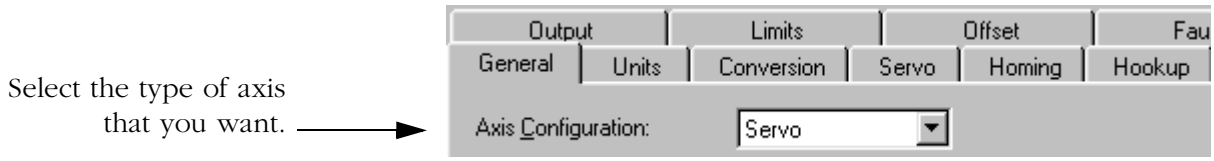
To configure an axis:

- Display the Properties for the Axis
- Select an Axis Configuration
- Assign Units for Measurements
- Assign a Conversion Constant
- 1756-M02AE - Select the Configuration of the Servo Drive
- 1756-M08SE - Select the Catalog Number of the Amplifier
- 1756-M08SE - Select the Motor and Feedback

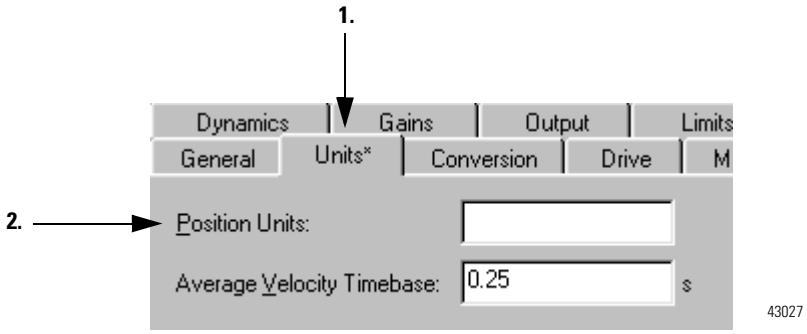
Display the Properties for the Axis



Select an Axis Configuration

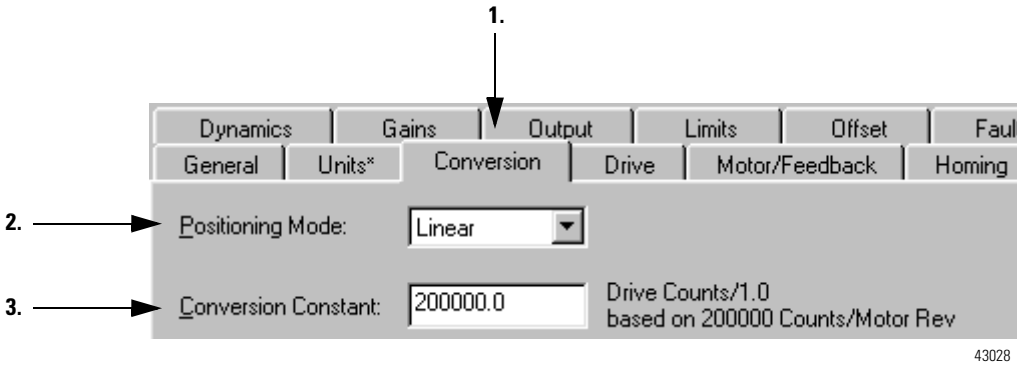


Assign Units for Measurements



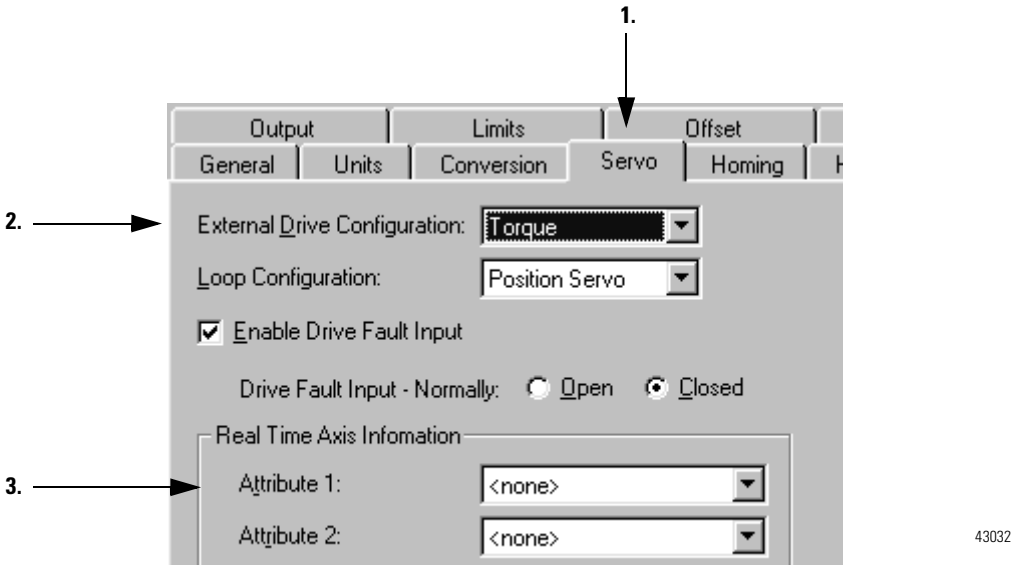
1. Click the *Units* tab.
2. Type the units in which you want to program, such as revs, degrees, inches, or millimeters.

Assign a Conversion Constant



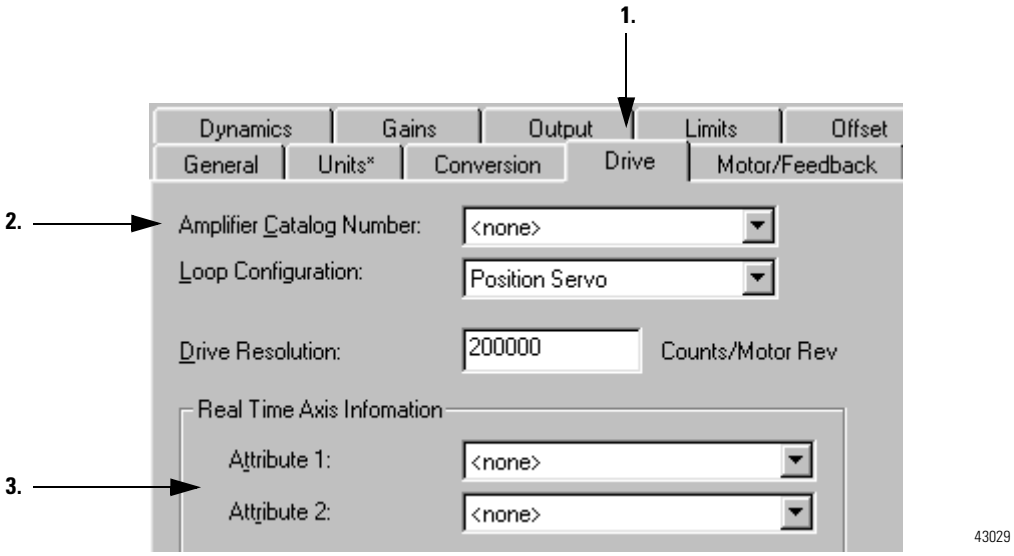
1. Click the *Conversion* tab.
2. Select the type of axis positioning that you want to use.
3. Type the counts per unit.

1756-M02AE - Select the Configuration of the Servo Drive



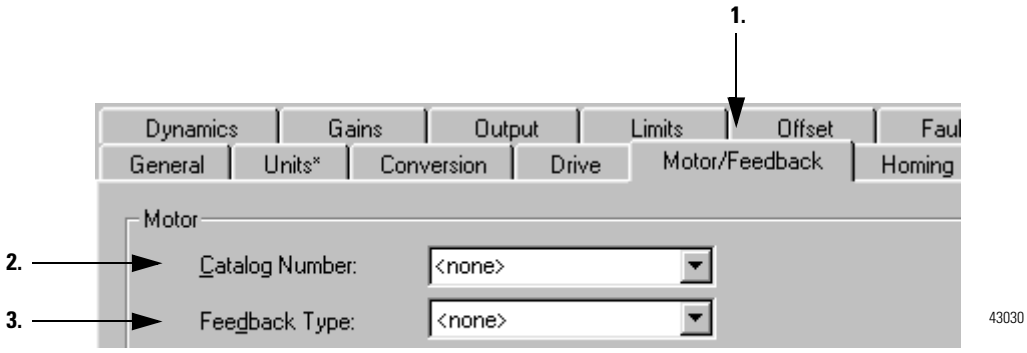
1. Click the *Servo* tab.
2. Select the configuration of the servo drive.
3. Optional: Select the two attributes of the AXIS object that you want to access via either a GSV instruction or tag name.
4. Choose *OK*.

1756-M08SE - Select the Catalog Number of the Amplifier



1. Click the *Drive* tab.
2. Select the catalog number of the amplifier.
3. Optional: Select the two attributes of the AXIS object that you want to access via either a GSV instruction or tag name.

1756-M08SE - Select the Motor and Feedback



1. Click the *Motor/Feedback* tab.
2. Select the catalog number of the motor.
3. In step 2, did you select a catalog number?

If:	Then:
Yes	Go to step 4.
No	Select the type of feedback.

4. Choose *OK*.

Run Hookup Tests

ATTENTION

These tests may cause an axis to move even with the controller in program mode. After you complete the Test Output & Feedback test, *do not* change the polarity. This may cause an axis-runaway condition.

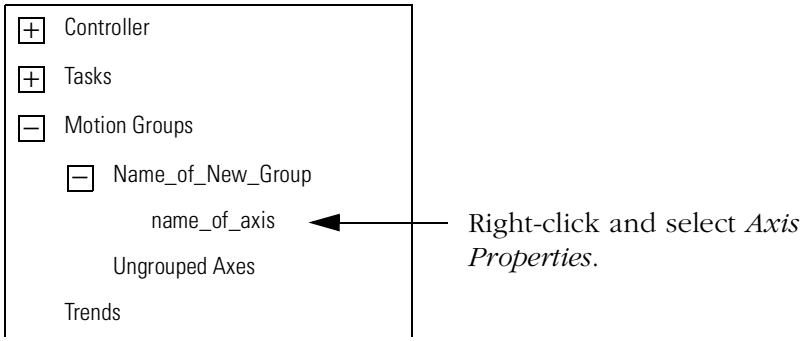
To run the hookup diagnostics for an axis:

- Download Your Project and Go Online
- Display the Properties for the Axis
- Complete the Hookup Tests

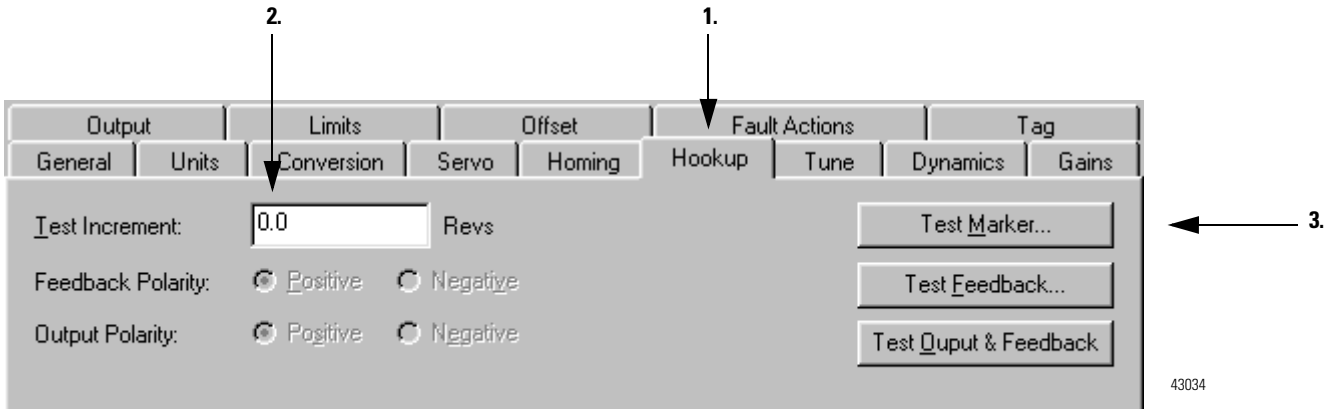
Download Your Project and Go Online

1. Create and configure all the motion modules and axes.
2. Save your project
3. Download your project..
4. Verify that a connection is established with each module in the I/O configuration of the controller.
5. For each SERCOS drive, make sure that the drive goes to Step 4.

Display the Properties for the Axis



Complete the Hookup Tests



1. Click the *Hookup* tab.
2. Type number of increments that the axis moves during each test.
3. Select each test and follow the prompts.
4. When you finish the hookup tests, choose *OK*.

For more information about hookup diagnostics, see the *ControlLogix Motion Module Setup and Configuration Manual*, publication 1756-UM006.

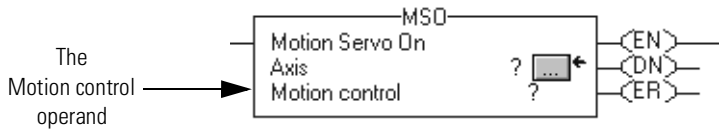
Develop Logic for Motion Control

To write a motion application program, you can insert motion instructions directly into your ladder logic program.

The motion instructions operate on one or more axes. You must identify and configure axes before you can use them. For more information about configuring axes, see the *ControlLogix Motion Module Setup and Configuration Manual*, publication 1756-UM006.

For more information on individual motion instructions, see the *Logix5000 Controllers Motion Instruction Set Reference Manual*, publication 1756-RM007.

Each motion instruction has an operand named Motion control. This field uses a MOTION_INSTRUCTION tag to store status information during the execution of motion instructions. This status information can include instruction status, errors, etc.



ATTENTION

Tags used for the motion control operand of motion instruction should only be used once. Re-use of the same motion control operand in other instructions can cause unintended operation of the control variables.

For more information about the MOTION_INSTRUCTION tag, refer to the appropriate motion instruction in the *Logix5000 Controllers Motion Instruction Set Reference Manual*, publication 1756-RM007.

You can read motion status and configuration parameters in your logic using two methods.

Method:	Example:
Directly accessing the MOTION_GROUP and AXIS structures	• Axis faults • Motion status
Using the GSV instruction	Actual position
Enable the Auto Tag Update attribute for a motion group	CommandAcceleration

In your ladder logic program, you can modify motion configuration parameters using the SSV instruction. For example, you can change position loop gain, velocity loop gain, and current limits within your program.

For more information on the SSV instruction, see the following publications:

- *Logix5000 Controllers General Instructions Reference Manual*, publication 1756-RM003
- *ControlLogix Motion Module Setup and Configuration Manual*, publication 1756-UM006

Handle Motion Faults

Two types of motion faults exist.

Type	Description	Example
Errors	• Do not impact controller operation • Should be correct to optimize execution time and ensure program accuracy	A Motion Axis Move (MAM) instruction with a parameter out of range
Minor/Major	• Caused by a problem with the servo loop • Can shutdown the controller if you do not correct the fault condition	The application exceeded the PositionErrorTolerance value.

You can configure a fault as either minor or major by using the Axis Wizard-Group window.

Understanding errors

Executing a motion instruction within an application program can generate errors. The MOTION_INSTRUCTION tag has a field that contains the error code. For more information about error codes for individual instructions, see the *Logix5000 Controllers Motion Instruction Set Reference Manual*, publication 1756-RM007.

Understanding minor/major faults

Several faults can occur that are not caused by motion instructions. For example, a loss of encoder feedback or an actual position exceeding an overtravel limit will cause faults. The motion faults are considered type 2 faults with error codes from 1 to 32. See *Logix5000 Controllers Common Procedures*, publication 1756-PM001.

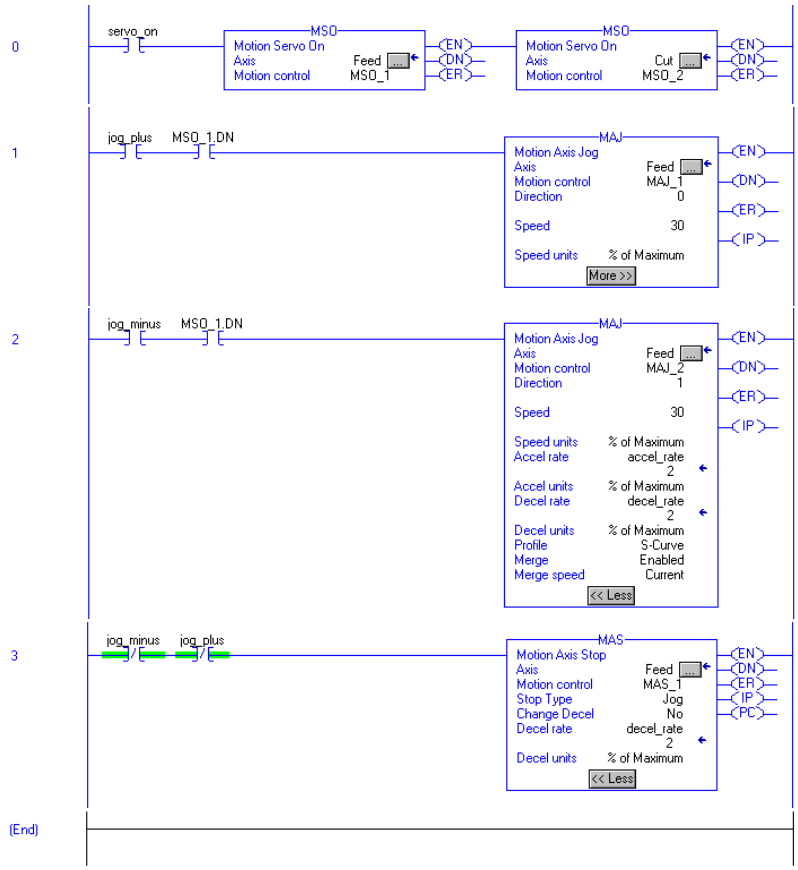
The following figure shows several rungs of a motion control application program.

Rung 0:
Enables the Feed and Cut axes when you press the servo_on button.

Rung 1:
Jogs the Feed axis in the positive direction when you press the jog_plus button.

Rung 2:
Jogs the Feed axis in the reverse direction when you press the jog_minus button.

Rung 3:
Stops the Feed axis when you release with the jog_plus button or the jog_minus button.



Notes:

Maintain the 1756-BA1 Battery

When to Use This Procedure

Use this procedure to ensure that the 1756-BA1 battery has sufficient capacity to maintain the memory of the controller and that the battery does not leak.

How to Use This Procedure

To complete this procedure, do the following steps:

- Estimate Battery Life
- Store Replacement Batteries
- Replace a Battery

Estimate Battery Life

When the battery is about 95 percent discharged, the controller provides the following warnings:

- On the front of the controller, the BAT LED turns on (solid red).
- A minor fault occurs (type 10, code 10).

To prevent the battery from leaking potentially dangerous chemicals, replace the battery at least as often as indicated in the following attention:

ATTENTION

To prevent possible battery leakage, even if the BAT LED is off, replace a battery according to the following schedule:

If the temperature 1 in. below the chassis is:	Replace the battery within:
0° to 35° C	No required replacement
36° to 40° C	3 years
41° to 45° C	2 years
46° to 50° C	16 months
51° to 55° C	11 months
56° to 60° C	8 months

To estimate how long the battery will support the memory of the controller:

A. Determine the temperature (° C) 1 in. below the chassis.

B. Determine the percentage of time that the controller is powered *off* per week.

EXAMPLE

Determine the percentage of time that the controller is powered off per week

If a controller is off:

- 8 hr/day during a 5-day work week
- all day Saturday and Sunday

Then the controller is off 52% of the time:

1. total hours per week = 7 x 24 +168 hours
2. total off hours per week = (5 days x 8 hr/day) + Saturday + Sunday = 88 hours
3. percentage off time = 88/168 = 52%

C. Using "Table 25.A Worst-case estimates of battery life" on page 25-3, determine the estimated worst-case battery life before and after the BAT LED turns on.

D. For each year of battery life, decrease the time before the BAT LED turns on by the percentage that is shown in the table. (Do not decrease the time after the BAT LED turns on.)

IMPORTANT If the BAT LED turns on when you apply power to the controller, the battery life *may* be less then the table below indicates. Some of the battery life may have been used up while the controller was off and unable to turn on the BAT LED.

Table 25.A Worst-case estimates of battery life

Controller:	Temperature:	Time before BAT LED turns on:			Time after BAT LED turns on and then power off 100%:
		Power off 100%	Power off 50%	Yearly decrease:	
1756-L1	60° C	8 months	8 months	24%	16 days
	25° C	18.5 months	30.5 months	16%	28 days
	0° C	20.2 months	33.7 months	16%	31 days
1756-L1M1	60° C	5.6 months	8 months	24%	8 days
	25° C	13.6 months	22.9 months	16%	20 days
	0° C	16.8 months	27.9 months	16%	25 days
1756-L1M2	60° C	4 months	7.4 months	24%	6 days
	25° C	11.7 months	20.1 months	16%	18 days
	0° C	16.0 months	26.6 months	16%	24 days
1756-L1M3	60° C	2.6 months	4.9 months	24%	4 days
	25° C	9.1 months	16.2 months	16%	14 days
	0° C	14.4 months	24.4 months	16%	22 days
1756-L55M12 1756-L55M13	60° C	57 days	110 days	23%	69 hours
	25° C	63 days	123 days	17%	76 hours
	0° C	60 days	118 days	17%	73 hours
1756-L55M14	60° C	29 days	57 days	23%	35 hours
	25° C	30 days	61 days	17%	37 hours
	0° C	24 days	48 days	17%	30 hours
1756-L55M16	60° C	15 days	30 days	23%	18 hours
	25° C	13 days	27 days	17%	16 hours
	0° C	6 days	12 days	36%	7 hours
1756-L55M22 1756-L55M23	Use the values for the 1756-L55M13 controller.				
1756-L55M24	Use the values for the 1756-L55M14 controller.				

Store Replacement Batteries

Because a battery may leak potentially dangerous chemicals if stored improperly, store batteries as follows:

ATTENTION

Store batteries in a cool, dry environment. We recommend 25° C with 40% to 60% relative humidity. You may store batteries for up to 30 days between -45° to 85° C, such as during transportation. To avoid possible leakage, *do not* store batteries above 60° C for more than 30 days.

Replace a Battery

Because the controller uses a lithium battery, you must follow specific precautions when handling or disposing a battery.

ATTENTION

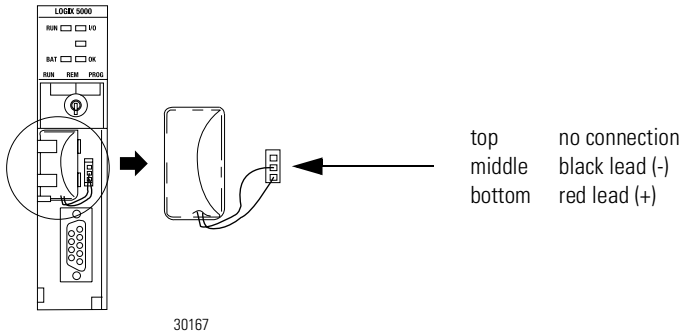
The controller uses a lithium battery, which contains potentially dangerous chemicals. Before handling or disposing a battery, review *Guidelines for Handling Lithium Batteries*, publication AG-5.4.

A. Turn on the chassis power.

B. Does the existing battery show signs of leakage or damage?

If:	Then:
Yes	Before handling the battery, review *Guidelines for Handling Lithium Batteries*, publication AG-5.4.
No	Go the next step.

C. Remove the old battery.



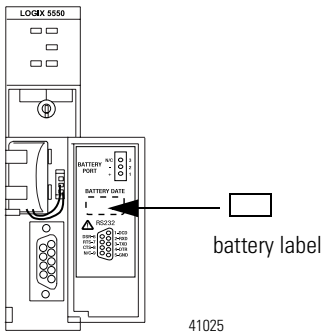
D. Install a new 1756-BA1 battery.

ATTENTION

Only install a 1756-BA1 battery. If you install a different battery, you may damage the controller.

E. On the front of the controller, is the BAT LED off?

If:	Then:
Yes	Go the next step.
No	1. Check that the battery is correctly connected to the controller. 2. If the BAT LED remains on, install another 1756-BA1 battery. 3. If the BAT LED remains on after you complete Step 2., contact your Rockwell Automation representative or local distributor.



F. Attach the battery label:

1. Write on the battery label the date you install the battery.
2. Attach the label to the inside of the controller door.

G. Dispose the old battery according to state and local regulations.

ATTENTION

Do not incinerate or dispose lithium batteries in general trash collection. They may explode or rupture violently. Follow state and local regulations for disposal of these materials. You are legally responsible for hazards created while your battery is being disposed.

Notes:

Map a PLC/SLC Address

When To Use This Procedure

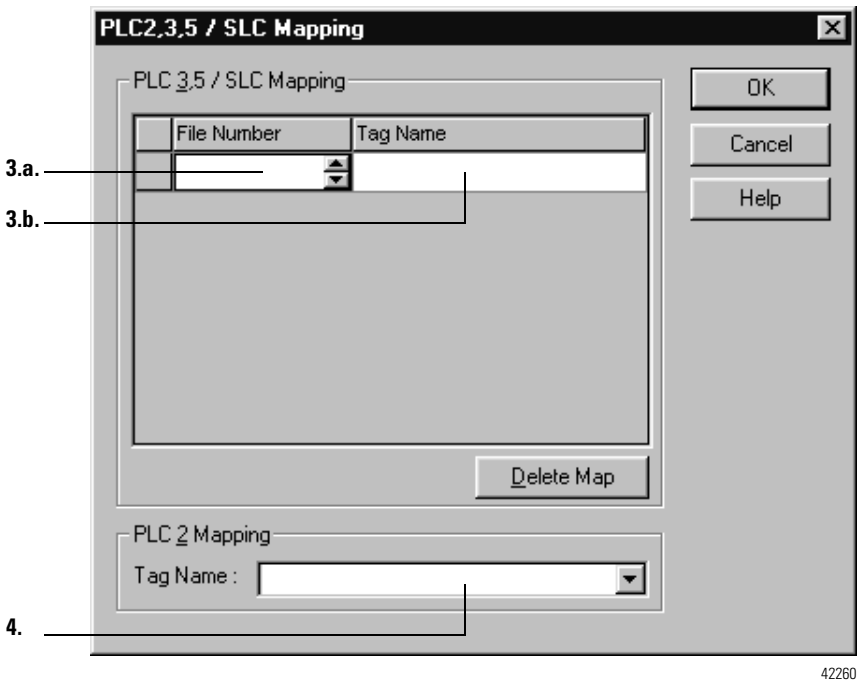
Use this procedure if you are sending a message from a PLC-5® or SLC 500™ controller to a ControlLogix controller and the PLC/SLC controller does not support Logical ASCII addressing.

To use a logical address (e.g., N7:0) to specify a value (tag) in a ControlLogix controller, you must map files to tags:

- You only have to map the file numbers that are used in messages; the other file numbers do not need to be mapped.
- The mapping table is loaded into the controller and is used whenever a “logical” address accesses data.
- You can only access controller-scoped tags (global data).

Map an Address

1. In RSLogix 5000™ software, open the project file for the controller whose data you want to access.
2. From the Logic menu, select *Map PLC/SLC Messages*.



3. For each file that is referenced in a PLC-5 or SLC command, make a map entry:
   a. Type the file number of the logical address.
   b. Type or select the controller-scoped (global) tag that supplies or receives data for the file number. (You can map multiple files to the same tag.)

4. For PLC-2 commands, specify the tag that supplies or receives the data.

5. Click *OK*.

Estimate Execution Time

When to Use This Procedure

Use this appendix to estimate the time required for the execution of: instructions and motion tasks.

To:	See page:
Estimate Execution Time of a Ladder Instruction	B-1
Estimate Execution Time of a Function Block Routine	B-23
Estimate Execution Time of a Motion Action	B-28

Times are for a ControlLogix controller (Cat. No. 1756-L1, -L1Mx, -L55Mxx) and RSLogix 5000™ software.

IMPORTANT Use this information to select among different programming options. Actual execution times may vary because of the configuration of your project and the version of RSLogix 5000 software that you are using.

Estimate Execution Time of a Ladder Instruction

1. From Table B.2 on page B-3, find the base time for the instruction.
2. To the base time of the instruction, add time for expressions, subscripts, and data conversions:

If an operand:	Then add time for:	Using this table:
contains an expression	each operation in the expression. For each operation, use the time for the corresponding instruction.	Table B.2 on page B-3
is an element of an array and one or more of the subscripts is a tag (e.g., *tag_c[tag_d]*)	the calculation of the array subscript	Table B.4 on page B-22
is converted by sign-extension	the data conversion	Table B.1 on page B-3
contains a SINT or INT tag in an array subscript	the conversion of the SINT or INT to a DINT	

Examples:

Instruction:	Data Type:	Execution Time:
CMP (*tag_a * tag_b / 100)*		4.3 µs overhead
* (MUL)	REAL	18.0 µs for the MUL operation
/ (DIV)	REAL	18.8 µs for the DIV operation
		41.1 µs total
ADD		10.8 µs for the ADD instruction
Source A	DINT	8.5 µs for DINT to REAL conversion
Source B	REAL	
Destination	REAL	
		19.3 µs total
ADD		10.8 µs for the ADD instruction
Source A	DINT[0,DINT]	25.5 µs for array subscript 8.5 µs for DINT to REAL conversion of array element
Source B	REAL	
Destination	REAL	
		44.8 µs total
MUL		18.0 µs for MUL instruction
Source A	REAL	
Source B	DINT	8.5 µs for DINT to REAL conversion
Destination	DINT	12.4 µs for REAL to DINT conversion
		38.9 µs total

Table B.1 Sign-Extension Conversion Times

To convert a:	To a:	Requires (µs):	
		1756-L1, -L1Mx	1756-L55Mx
DINT	INT	7.4	6.1
DINT	REAL	8.1	6.5
DINT	SINT	7.3	6.0
INT	DINT	1.2	1.1
INT	REAL	1.9	1.9
REAL	DINT	12.4	9.8
REAL	INT	15.0	11.8
REAL	SINT	14.9	11.7
SINT	DINT	1.0	1.0
SINT	REAL	1.7	1.7

Table B.2 Execution Times for Ladder Instructions

Instruction:	Data type:	True Time (µs):		Notes:
		1756-L1, -L1Mx	1756-L55Mxx	
ABL	n/a	13.7	11.4	
ABS	DINT	0.61	0.61	
ABS	REAL	0.88	0.87	
ACB	n/a	13.2	10.9	
ACL	n/a	126.5	98.7	
ACS	REAL	272.5	250.5	
ADD	DINT	0.57	0.55	
ADD	REAL	10.8	10.4	
AFI	n/a	0.1	0.1	
AHL	n/a	92.2	71.8	
AND	DINT	0.57	0.55	
ARD	n/a	76.8	60.1	
ARL	n/a	77.0	60.2	
ASN	REAL	263.1	241.8	
ATN	REAL	224.7	213.2	

Table B.2 Execution Times for Ladder Instructions (Continued)

Instruction:	Data type:	True Time (µs):		Notes:
		1756-L1, -L1Mx	1756-L55Mxx	
AVE	SINT	54.4 + (x * 6.6)	47.0 + (x * 5.8)	*x* = Length
AVE	INT	54.5 + (x * 7.0)	47.0 + (x * 6.1)	
AVE	DINT	53.9 + (x * 6.5)	46.8 + (x * 5.7)	
AVE	REAL	44.0 + (x * 14.7)	38.7 + (x * 13.6)	
AWA	n/a	79.5	61.7	
AWT	n/a	79.6	61.8	
BSL	DINT	7.9 + ((x /32) * 0.8)	6.4 + ((x /32) * 0.6)	*x* = Length
BSR	DINT	8.7 + ((x /32) * 0.8)	7.0 + ((x /32) * 0.6)	Round up *x* /32 to a whole number.
BTD	DINT	12.7	10.5	
CLR	DINT	0.35	0.34	
CLR	REAL	0.40	0.39	
CMP		4.31	3.6	
CONCAT	n/a	10.7 + (x * 1.4)	9.1 + (x * 1.1)	x = number of characters in Source A + number of characters in Source B
COP	SINT	6.9 + (x * 0.1)	6.5 + (x * 0.1)	*x* = Length
COP	INT	6.7 + (x * 0.2)	6.2 + (x * 0.2)	
COP	DINT	7.1 + (x * 0.3)	6.6 + (x * 0.3)	
COP	REAL	7.1 + (x * 0.3)	6.6 + (x * 0.3)	
COS	REAL	222.9	208.3	
CPS	SINT	15.4 + (x * 0.1)	13.8 + (x * 0.1)	x = Length
CPS	INT	15.2 + (x * 0.2)	13.4 + (x * 0.2)	
CPS	DINT	15.7 + (x * 0.3)	13.9 + (x * 0.3)	
CPS	REAL	15.7 + (x * 0.3)	13.9 + (x * 0.3)	
CPT	n/a	4.8	4.0	
CTD	COUNTER	0.43	0.42	
CTU	COUNTER	0.43	0.42	
DDT 0 mismatches	DINT	13.1 + (x * 1.4)	10.6 + (x * 1.0)	*x* = number of bits to compare
DDT 1 mismatches	DINT	27.9 + (x * 1.4)	21.6 + (x * 1.0)	Based on ALL mode
DDT 2 mismatches	DINT	41.6 + (x * 1.4)	31.6 + (x * 1.0)	
DEG	REAL	18.8	18.2	
DELETE	n/a	10.6 + (x * 1.6)	8.9 + (x * 1.2)	x = number of characters in Source A + number of characters in Source B
DIV	DINT	11.0	10.5	
DIV	REAL	18.8	18.2	

Table B.2 Execution Times for Ladder Instructions (Continued)

Instruction:	Data type:	True Time (µs):		Notes:
		1756-L1, -L1Mx	1756-L55Mxx	
DTOS	n/a	65.5 + (1.4 * d) + (0.7 * x)	41.5 + (0.6 * d) + (0.6 * x)	d = number of digits in Source x = number of characters in Destination
DTR	DINT	2.9	2.4	
EQU	DINT	0.38	0.4	
EQU	REAL	0.38	0.4	
FAL	n/a	10.3 + (x * (4.0 + e)	9.77 + (x * (3.8 + e)	*x* = number of elements manipulated in one scan *e* = time for the operators in the expression
FBC 0 mismatches	DINT	13.2 + (x * 1.4)	10.7 + (x * 1.0)	*x* = number of bits to compare Based on ALL mode
FBC 1 mismatches	DINT	26.6 + (x * 1.4)	20.6 + (x * 1.0)	
FBC 2 mismatches	DINT	39.0 + (x * 1.4)	29.7 + (x * 1.0)	
FFL	SINT	9.8	8.0	
FFL	INT	10.9	8.8	
FFL	DINT	10.2	8.3	
FFL	REAL	10.2	8.3	
FFU	SINT	11.1 + (x * 0.6)	8.9 + (x * 0.5)	*x* = Length
FFU	INT	12.1 + (x * 1.0)	9.7 + (x * 0.8)	
FFU	DINT	12.5 + (x * 0.6)	9.9 + (x * 0.4)	
FFU	REAL	12.5 + (x * 0.6)	9.9 + (x * 0.4)	
FIND	n/a	8.0 + (1.8 * x) + (1.3 * (r - s + 1))	6.7 + (1.4 * x) + (r - s + 1)	x = number of characters in Search r = Result s = Start
FLL	SINT	4.5 + (x * 0.2)	4.1 + (x * 0.3)	*x* = Length
FLL	INT	4.7 + (x * 0.2)	4.3 + (x * 0.3)	
FLL	DINT	5.3 + (x * 0.2)	4.9 + (x * 0.2)	
FLL	REAL	5.3 + (x * 0.2)	4.9 + (x * 0.2)	
FOR	DINT	15.8 + (x * 7.3)	12.6 + (x * 6.0)	*x* = Terminal value/Step size
FRD	n/a	9.0	6.9	
FSC	n/a	10.8 + (x * (3.9 + e)	10.15 + (x * (3.7 + e)	*x* = number of elements manipulated in one scan *e* = time for the operators in the expression
GEQ	DINT	0.38	0.4	
GEQ	REAL	0.59	0.6	
GRT	DINT	0.38	0.4	
GRT	REAL	0.59	0.6	
GSV	n/a	See Table B.3 on page B-10		

Table B.2 Execution Times for Ladder Instructions (Continued)

Instruction:	Data type:	True Time (µs):		Notes:
		1756-L1, -L1Mx	1756-L55Mxx	
INSERT	n/a	13.8 + (x * 1.3)	11.0 + (x * 1.0)	x = number of characters in Source A + number of characters in Source B
JMP		1.6	1.2	
JSR (no parameters)	n/a	10.8	10.2	
JSR/RET	SINT	21.0 + (x * 3.8)	20.2 + (x * 3.7)	*x* = number of parameters The time is for the JSR/RET pair.
JSR/RET	INT	20.9 + (x * 4.2)	20.1 + (x * 4.1)	
JSR/RET	DINT	20.9 + (x * 3.6)	20.2 + (x * 3.5)	
JSR/RET	REAL	20.9 + (x * 3.6)	20.2 + (x * 3.5)	
JSR/SBR	SINT	21.5 + (x * 3.8)	20.8 + (x * 3.7)	*x* = number of parameters The time is for the JSR/SBR pair.
JSR/SBR	INT	21.5 + (x * 4.2)	20.7 + (x * 4.1)	
JSR/SBR	DINT	21.6 + (x * 3.6)	20.9 + (x * 3.5)	
JSR/SBR	REAL	21.5 + (x * 3.6)	20.7 + (x * 3.5)	
LBL		0.2	0.20	
LEQ	DINT	0.38	0.4	
LEQ	REAL	0.59	0.6	
LES	DINT	0.38	0.4	
LES	REAL	0.59	0.6	
LFL	SINT	9.8	8.0	
LFL	INT	10.9	8.8	
LFL	DINT	10.2	8.3	
LFL	REAL	10.2	8.3	
LFU	SINT	12.0	9.7	
LFU	INT	13.4	10.7	
LFU	DINT	14.3	11.2	
LFU	REAL	14.2	11.2	
LIM	DINT	0.81	0.8	
LIM	REAL	3.55	2.9	
LN	REAL	192.9	181.9	
LOG	REAL	193.3	182.3	
LOWER	n/a	7.5 + (x * 1.4)	6.4 + (x * 1.1)	x = number of characters in Source A + number of characters in Source B
MAAT	n/a	173	110	
MAG	n/a	862	523	
MAH (switch/marker)	n/a	70	48	
MAJ	n/a	227	107	

Table B.2 Execution Times for Ladder Instructions (Continued)

Instruction:	Data type:	True Time (µs):		Notes:
		1756-L1, -L1Mx	1756-L55Mxx	
MAJ (w/ merge)	n/a	394	247	
MAM	n/a	471	263	
MAM (w/ merge)	n/a	665	349	
MAPC	n/a	479	295	
MAR	n/a	168	109	
MAS (all w/ move and jog running)	n/a	331	205	
MAS (individual motion types)	n/a	110	71	
MASD	n/a	135	89	
MASR	n/a	40	29	
MATC	n/a	149	103	
MAW	n/a	161	108	
MCCP (cubic)	n/a	518	304	
MCCP (linear)	n/a	178	105	
MCD	n/a	84	62	
MCR	n/a	0.1	0.1	
MDR	n/a	146	97	
MDW	n/a	136	90	
MEQ	DINT	0.59	0.6	
MGPS (fast shutdown w/ move and jog running)	n/a	65	43	
MGPS (fast stop w/ move and jog running)	n/a	69	43	
MGPS (hard shutdown w/ move and jog running)	n/a	58	44	
MGS (w/ move and jog running)	n/a	70	53	
MGSD	n/a	62	42	
MGSR	n/a	67	43	
MID	n/a	10.2 + (x * 1.6)	8.5 + (x * 1.3)	x = number of characters in Source A + number of characters in Source B
MOD	DINT	20.3	18.0	
MOD	REAL	64.1	57.2	
MOV	DINT-DINT	0.5	0.4	
MOV	REAL-REAL	0.8	0.8	

Table B.2 Execution Times for Ladder Instructions (Continued)

Instruction:	Data type:	True Time (µs):		Notes:
		1756-L1, -L1Mx	1756-L55Mxx	
MRAT	n/a	45	32	
MRP	n/a	89	58	
MSF	n/a	154	102	
MSG	n/a	163.6	119.9	
MSO	n/a	51	35	
MUL	DINT	9.6	9.2	
MUL	REAL	18.0	17.4	
MVM	n/a	11.6	9.7	
NEG	DINT	0.57	0.55	
NEG	REAL	0.94	0.92	
NEQ	DINT	0.38	0.4	
NEQ	REAL	0.38	0.4	
NOP	n/a	0.05	0.05	
NOT	DINT	0.51	0.49	
ONS	BOOL	2.8	2.6	
OR	DINT	0.57	0.55	
OSF	BOOL	3.4	2.9	
OSR	BOOL	3.7	3.1	
OTE	BOOL	0.2	0.2	
OTL	BOOL	0.2	0.2	
OTU	BOOL	0.2	0.2	
PID (independent - slave mode)		378.6	349.1	
PID (independent)		356.5	328.0	
PID (ISA - dependent)		425.5	394.1	
PID (manual mode)		311.0	284.2	
PID (set output mode)		311.0	284.2	
RAD	REAL	18.4	17.8	
RES	T,C or R	0.32	0.32	
RET (in FOR loop)	n/a	4.6	4.5	
RET (no parameters)	n/a	4.1	3.9	
RTO	TIMER	0.43	0.42	
RTOS - example 1	n/a	816.8	473.9	Source = 1234.5677
RTOS - example 2	n/a	1045	611.5	Source = 1.234
SBR (no parameters)	n/a	4.8	4.6	

Table B.2 Execution Times for Ladder Instructions (Continued)

Instruction:	Data type:	True Time (µs):		Notes:
		1756-L1, -L1Mx	1756-L55Mxx	
SIN	REAL	229.2	214.4	
SIZE	DINT	5.6	4.9	
SQI	DINT	3.7	3.1	
SQL	DINT	6.1	5.0	
SQO	DINT	6.2	4.9	
SQR	DINT	9.9	7.6	
SQR	REAL	37.5	27.9	
SRT	DINT	30.4	25.7	Varies with the length and randomness of the numbers.
SRT	REAL	35.2	29.3	
SSV	n/a	See Table B.3 on page B-10		
STD	SINT	106.9 + (x * 51.9)	87.1 + (x * 47.9)	*x* = Length
STD	INT	113.4 + (x * 52.5)	93.3 + (x * 48.3)	
STD	DINT	113.3 + (x * 51.4)	93.4 + (x * 47.5)	
STD	REAL	115.1 + (x * 55.8)	95.8 + (x * 52.5)	
STOD - example 1	n/a	79.0	56.3	Source = ABCDEFGH1234ABCDEFGH
STOD - example 2	n/a	53.6	36.6	Source = 1234
STOR - example 1	n/a	594.8	353.1	Source = ABCDEFGH1.234ABCDEFGH
STOR - example 2	n/a	569.5	333.7	Source = 1.234
SUB	DINT	0.57	0.55	
SUB	REAL	10.7	10.3	
SWPB (High/Low)	DINT	6.7	5.3	
SWPB (Reverse)	DINT	5.5	4.7	
SWPB (Word)	DINT	5.9	4.9	
TAN	REAL	289.8	272.3	
TND	n/a	0.002	0.01	
TOD	n/a	15.0	11.4	
TOF	TIMER	0.32	0.31	
TON	TIMER	0.43	0.42	
TRN	DINT	13.1	10.2	
TRN	REAL	21.2	16.7	
UID	n/a	37.9	27.9	
UIE	n/a	37.3	27.5	
UPPER	n/a	7.8 + (x * 1.4)	6.4 + (x * 1.1)	x = number of characters in Source A + number of characters in Source B
XIC	BOOL	0.1	0.1	

Table B.2 Execution Times for Ladder Instructions (Continued)

Instruction:	Data type:	True Time (µs):		Notes:
		1756-L1, -L1Mx	1756-L55Mxx	
XIO	BOOL	0.1	0.1	
XOR	DINT	0.57	0.54	
XPY	REAL	500.4	450.0	Actual time depends on the values of the operands.

Table B.3 Execution Times for the GSV and SSVInstructions

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
AXIS AccelerationCommand	GSV	39.8	28.7
AXIS AccelerationDataScaling	GSV	36.3	25.9
AXIS AccelerationDataScalingExp	GSV	36.9	26.0
AXIS AccelerationDataScalingFact	GSV	36.4	26.2
AXIS AccelerationFeedback	GSV	39.8	28.6
AXIS AccelerationFeedforwardGain	GSV	38.5	27.7
AXIS AccelerationFeedforwardGain	SSV	130.4	107.5
AXIS AccelerationLimitBipolar	GSV	36.0	25.9
AXIS AccelerationLimitBipolar	SSV	128.7	106.1
AXIS AccelerationLimitNegative	GSV	36.0	26.0
AXIS AccelerationLimitNegative	SSV	128.7	106.1
AXIS AccelerationLimitPositive	GSV	36.0	26.0
AXIS AccelerationLimitPositive	SSV	128.7	106.1
AXIS ActualAcceleration	GSV	60.0	40.9
AXIS ActualPosition	GSV	59.8	40.7
AXIS ActualVelocity	GSV	59.7	40.7
AXIS ATConfigurationList	GSV	88.1	59.4
AXIS AttributeErrorCode	GSV	36.8	26.6
AXIS AttributeErrorID	GSV	37.3	26.8
AXIS AuxFeedbackConfiguration	GSV	36.2	25.8
AXIS AuxFeedbackRatio	GSV	36.6	26.4
AXIS AuxFeedbackResolution	GSV	36.6	26.4
AXIS AuxFeedbackType	GSV	34.8	25.1
AXIS AuxPositionFeedback	GSV	39.8	28.7
AXIS AverageVelocity	GSV	121.1	82.6

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
AXIS AverageVelocityTimebase	GSV	40.6	29.3
AXIS AverageVelocityTimebase	SSV	130.7	108.0
AXIS AxisConfigurationState	GSV	28.8	20.7
AXIS AxisControlBits	GSV	39.1	28.1
AXIS AxisEventBits	GSV	40.1	29.1
AXIS AxisFaultBits	GSV	40.0	29.1
AXIS AxisInfoSelect1	GSV	38.5	27.6
AXIS AxisInfoSelect1	SSV	130.4	107.6
AXIS AxisInfoSelect2	GSV	38.5	27.7
AXIS AxisInfoSelect2	SSV	130.4	107.6
AXIS AxisInstance	GSV	34.4	24.9
AXIS AxisResponseBits	GSV	108.8	84.1
AXIS AxisState	GSV	24.2	18.0
AXIS AxisStatusBits	GSV	40.1	29.1
AXIS AxisType	GSV	36.3	26.1
AXIS AxisType	SSV	123.7	103.8
AXIS BrakeEngageDelayTime	SSV	128.7	106.0
AXIS BrakeOffDelayTime	GSV	35.6	25.8
AXIS BrakeOnDelayTime	GSV	36.0	26.0
AXIS BrakeReleaseDelayTime	SSV	128.7	106.0
AXIS BusRegulatorCapacity	GSV	37.2	26.9
AXIS BusRegulatorID	GSV	36.8	25.9
AXIS C2CConnectionInstance	GSV	40.3	29.2
AXIS C2CMapInstance	GSV	40.4	29.2
AXIS CommandAcceleration	GSV	59.9	40.9
AXIS CommandPosition	GSV	60.2	40.9
AXIS CommandVelocity	GSV	59.7	40.7
AXIS ConversionConstant	GSV	40.9	29.4
AXIS ConversionConstant	SSV	126.4	105.7
AXIS DampingFactor	GSV	38.5	27.7
AXIS DampingFactor	SSV	130.5	107.5
AXIS DCBusVoltage	GSV	37.2	26.9
AXIS DriveAxisID	GSV	36.2	25.8
AXIS DriveCapacity	GSV	37.2	26.9
AXIS DriveFaultAction	GSV	28.2	19.7

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
AXIS DriveFaultAction	SSV	129.4	106.4
AXIS DriveFaultBits	GSV	37.2	26.9
AXIS DriveModelTimeConstant	GSV	38.5	27.7
AXIS DriveModelTimeConstant	SSV	130.4	107.5
AXIS DrivePolarity	GSV	36.6	26.4
AXIS DrivePolarity	SSV	129.3	106.5
AXIS DriveScalingBits	GSV	36.6	26.4
AXIS DriveStatusBits	GSV	37.2	26.9
AXIS DriveThermalFaultAction	GSV	25.6	18.1
AXIS DriveThermalFaultAction	SSV	127.9	105.4
AXIS DriveWarningBits	GSV	37.2	26.9
AXIS ExternalDriveType	GSV	37.8	27.4
AXIS FaultConfigurationBits	GSV	38.4	27.7
AXIS FaultConfigurationBits	SSV	130.5	107.5
AXIS FeedbackFaultAction	GSV	28.2	19.7
AXIS FeedbackFaultAction	SSV	129.4	106.3
AXIS FeedbackNoiseFaultAction	GSV	28.5	19.8
AXIS FeedbackNoiseFaultAction	SSV	129.4	106.3
AXIS FrictionCompensation	GSV	38.0	27.3
AXIS FrictionCompensation	SSV	130.0	107.0
AXIS GroupInstance	GSV	28.0	20.7
AXIS HardOvertravelFaultAction	GSV	28.6	19.9
AXIS HardOvertravelFaultAction	SSV	129.4	106.3
AXIS HomeConfigurationBits	GSV	41.0	29.6
AXIS HomeConfigurationBits	SSV	130.9	108.2
AXIS HomeDirection	GSV	28.6	20.6
AXIS HomeDirection	SSV	130.2	107.6
AXIS HomeMode	GSV	27.9	20.2
AXIS HomeMode	SSV	130.2	107.6
AXIS HomeOffset	GSV	41.0	29.5
AXIS HomeOffset	SSV	130.8	108.2
AXIS HomePosition	GSV	41.0	29.5
AXIS HomePosition	SSV	130.8	108.2
AXIS HomeReturnSpeed	GSV	41.2	29.6
AXIS HomeReturnSpeed	SSV	131.3	108.2

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
AXIS HomeSequence	GSV	29.0	20.7
AXIS HomeSequence	SSV	130.2	107.6
AXIS HomeSpeed	GSV	41.2	29.6
AXIS HomeSpeed	SSV	131.3	108.2
AXIS IntegratorHoldEnable	GSV	28.2	19.7
AXIS IntegratorHoldEnable	SSV	129.4	106.4
AXIS InterpolatedActualPosition	GSV	39.3	28.7
AXIS InterpolatedCommandPosition	GSV	40.6	29.3
AXIS InterpolationTime	GSV	40.0	29.1
AXIS InterpolationTime	SSV	130.1	107.9
AXIS MapInstance	GSV	40.4	29.3
AXIS MarkerDistance	GSV	39.8	28.6
AXIS MasterOffset	GSV	59.4	40.5
AXIS MaximumAcceleration	GSV	41.2	29.6
AXIS MaximumAcceleration	SSV	131.3	108.2
AXIS MaximumDeceleration	GSV	40.9	29.4
AXIS MaximumDeceleration	SSV	131.3	108.2
AXIS MaximumNegativeTravel	GSV	38.0	27.3
AXIS MaximumNegativeTravel	SSV	129.9	107.0
AXIS MaximumPositiveTravel	GSV	38.0	27.3
AXIS MaximumPositiveTravel	SSV	129.9	107.0
AXIS MaximumSpeed	GSV	41.2	29.6
AXIS MaximumSpeed	SSV	131.3	108.2
AXIS MDTConfigurationList	GSV	48.3	32.9
AXIS MemoryUse	GSV	22.9	17.4
AXIS MemoryUse	GSV	22.9	17.4
AXIS ModuleChannel	GSV	28.2	20.4
AXIS ModuleClassCode	GSV	41.4	29.8
AXIS ModuleFaultBits	GSV	39.1	28.1
AXIS MotionStatusBits	GSV	40.0	29.1
AXIS MotorCapacity	GSV	37.2	26.9
AXIS MotorData	GSV	563.9	355.6
AXIS MotorElectricalAngle	GSV	37.2	26.9
AXIS MotorFeedbackConfiguration	GSV	35.6	25.5
AXIS MotorFeedbackResolution	GSV	36.6	26.4

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
AXIS MotorFeedbackType	GSV	35.9	25.6
AXIS MotorID	GSV	36.6	26.4
AXIS MotorThermalFaultAction	GSV	25.9	18.3
AXIS MotorThermalFaultAction	SSV	128.0	105.3
AXIS NegativeDynamicTorqueLimit	GSV	37.2	26.9
AXIS OutputCamExecutionTargets	GSV	39.1	28.6
AXIS OutputCamLockStatus	GSV	39.6	28.9
AXIS OutputCamPendingStatus	GSV	38.1	28.1
AXIS OutputCamStatus	GSV	39.7	28.9
AXIS OutputCamTransitionStatus	GSV	39.6	28.8
AXIS OutputLimit	GSV	37.3	27.0
AXIS OutputLimit	SSV	129.9	107.0
AXIS OutputLPFilterBandwidth	GSV	38.5	27.7
AXIS OutputLPFilterBandwidth	SSV	130.4	107.6
AXIS OutputNotchFilterFrequency	GSV	36.0	26.0
AXIS OutputNotchFilterFrequency	SSV	128.7	106.1
AXIS OutputOffset	GSV	37.0	26.9
AXIS OutputOffset	SSV	129.9	107.0
AXIS placeholder	GSV	0.0	0.0
AXIS PositionCommand	GSV	39.9	28.6
AXIS PositionDataScaling	GSV	36.5	25.9
AXIS PositionDataScalingExp	GSV	34.4	24.9
AXIS PositionDataScalingFactor	GSV	36.7	26.4
AXIS PositionError	GSV	39.8	28.6
AXIS PositionErrorFaultAction	GSV	27.5	19.4
AXIS PositionErrorFaultAction	SSV	129.4	106.4
AXIS PositionErrorTolerance	GSV	38.0	27.3
AXIS PositionErrorTolerance	SSV	129.9	107.0
AXIS PositionFeedback	GSV	39.8	28.6
AXIS PositionIntegralGain	GSV	38.5	27.7
AXIS PositionIntegralGain	SSV	130.4	107.6
AXIS PositionIntegratorError	GSV	39.8	28.6
AXIS PositionLockTolerance	GSV	38.1	27.3
AXIS PositionLockTolerance	SSV	129.9	107.0
AXIS PositionPolarity	GSV	36.2	25.7

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
AXIS PositionProportionalGain	GSV	38.5	27.7
AXIS PositionProportionalGain	SSV	130.5	107.5
AXIS PositionServoBandwidth	GSV	38.5	27.7
AXIS PositionServoBandwidth	SSV	130.5	107.4
AXIS PositionUnwind	GSV	39.4	28.7
AXIS PositionUnwind	SSV	130.6	108.0
AXIS PositiveDynamicTorqueLimit	GSV	37.2	26.8
AXIS PowerCapacity	GSV	37.2	26.9
AXIS PowerSupplyID	GSV	36.2	25.6
AXIS PrimaryOperationMode	GSV	35.1	25.2
AXIS ProgrammedStopMode	GSV	29.9	21.1
AXIS ProgrammedStopMode	SSV	130.5	107.7
AXIS Registration1Position	GSV	39.6	28.9
AXIS Registration1Time	GSV	37.3	27.8
AXIS Registration2Position	GSV	39.3	28.7
AXIS Registration2Time	GSV	39.7	28.9
AXIS RotaryAxis	GSV	29.2	20.8
AXIS RotaryAxis	GSV	29.2	20.8
AXIS RotaryAxis	SSV	130.1	107.5
AXIS RotationalPosResolution	GSV	36.5	26.4
AXIS SercosErrorCode	GSV	36.3	26.0
AXIS ServoFaultBits	GSV	38.4	27.8
AXIS ServoLoopConfiguration	GSV	36.7	26.4
AXIS ServoLoopConfiguration	SSV	108.8	94.1
AXIS ServoOutputLevel	GSV	39.1	28.3
AXIS ServoPolarityBits	GSV	37.8	27.3
AXIS ServoPolarityBits	SSV	130.5	107.6
AXIS ServoStatusBits	GSV	38.4	27.8
AXIS SoftOvertravelFaultAction	GSV	28.9	20.1
AXIS SoftOvertravelFaultAction	SSV	129.4	106.3
AXIS StartActualPosition	GSV	39.6	28.8
AXIS StartCommandPosition	GSV	39.1	28.6
AXIS StartMasterOffset	GSV	40.6	29.3
AXIS StoppingTimeLimit	GSV	36.0	26.0
AXIS StoppingTimeLimit	SSV	128.7	106.1

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
AXIS StoppingTorque	GSV	36.0	25.9
AXIS StoppingTorque	SSV	128.7	106.1
AXIS StrobeActualPosition	GSV	39.6	28.9
AXIS StrobeCommandPosition	GSV	40.7	29.3
AXIS StrobeMasterOffset	GSV	40.6	29.3
AXIS TelegramType	GSV	36.0	25.7
AXIS TestDirectionForward	GSV	29.0	20.4
AXIS TestIncrement	GSV	38.5	27.6
AXIS TestIncrement	SSV	130.4	107.4
AXIS TestStatus	GSV	37.6	27.0
AXIS TorqueCommand	GSV	37.2	26.8
AXIS TorqueDataScaling	GSV	33.9	24.6
AXIS TorqueDataScalingExp	GSV	36.2	25.8
AXIS TorqueDataScalingFactor	GSV	36.7	26.4
AXIS TorqueFeedback	GSV	37.2	26.9
AXIS TorqueLimitBipolar	GSV	36.0	26.0
AXIS TorqueLimitBipolar	SSV	128.7	106.1
AXIS TorqueLimitNegative	GSV	36.0	26.0
AXIS TorqueLimitNegative	SSV	128.8	106.1
AXIS TorqueLimitPositive	GSV	36.0	26.0
AXIS TorqueLimitPositive	SSV	128.7	106.1
AXIS TorqueLimitSource	GSV	37.2	26.8
AXIS TorqueOffset	GSV	38.0	27.3
AXIS TorqueOffset	SSV	129.9	107.0
AXIS TorquePolarity	GSV	36.2	25.7
AXIS TorqueScaling	GSV	38.5	27.7
AXIS TorqueScaling	SSV	130.4	107.6
AXIS TorqueThreshold	GSV	36.0	25.9
AXIS TorqueThreshold	SSV	128.7	106.1
AXIS TuneAcceleration	GSV	39.1	28.1
AXIS TuneAccelerationTime	GSV	39.1	28.1
AXIS TuneDeceleration	GSV	39.1	28.1
AXIS TuneDecelerationTime	GSV	39.1	28.1
AXIS TuneInertia	GSV	39.1	28.1
AXIS TuneRiseTime	GSV	38.4	27.8

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
AXIS TuneSpeedScaling	GSV	38.4	27.8
AXIS TuneStatus	GSV	36.2	26.3
AXIS TuningConfigurationBits	GSV	38.5	27.6
AXIS TuningConfigurationBits	SSV	130.4	107.4
AXIS TuningSpeed	GSV	38.5	27.6
AXIS TuningSpeed	SSV	130.4	107.4
AXIS TuningTorque	GSV	38.5	27.7
AXIS TuningTorque	SSV	130.4	107.4
AXIS TuningTravelLimit	GSV	38.5	27.7
AXIS TuningTravelLimit	SSV	130.4	107.4
AXIS VelocityCommand	GSV	39.8	28.7
AXIS VelocityDataScaling	GSV	35.3	25.3
AXIS VelocityDataScalingExp	GSV	35.7	25.5
AXIS VelocityDataScalingFactor	GSV	36.7	26.4
AXIS VelocityDroop	GSV	36.0	26.0
AXIS VelocityDroop	SSV	128.7	106.1
AXIS VelocityError	GSV	39.8	28.6
AXIS VelocityFeedback	GSV	39.8	28.6
AXIS VelocityFeedforwardGain	GSV	38.5	27.7
AXIS VelocityFeedforwardGain	SSV	130.5	107.5
AXIS VelocityIntegralGain	GSV	38.5	27.7
AXIS VelocityIntegralGain	SSV	130.5	107.6
AXIS VelocityIntegratorError	GSV	39.8	28.6
AXIS VelocityLimitBipolar	GSV	36.0	26.0
AXIS VelocityLimitBipolar	SSV	128.7	106.0
AXIS VelocityLimitNegative	GSV	36.0	25.9
AXIS VelocityLimitNegative	SSV	128.7	106.1
AXIS VelocityLimitPositive	GSV	36.0	26.0
AXIS VelocityLimitPositive	SSV	128.7	106.1
AXIS VelocityOffset	GSV	38.0	27.3
AXIS VelocityOffset	SSV	129.9	107.0
AXIS VelocityPolarity	GSV	36.2	25.8
AXIS VelocityProportionalGain	GSV	33.9	27.7
AXIS VelocityProportionalGain	SSV	130.4	107.6
AXIS VelocityScaling	GSV	37.8	27.3

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
AXIS VelocityScaling	SSV	130.5	107.6
AXIS VelocityServoBandwidth	GSV	38.5	27.7
AXIS VelocityServoBandwidth	SSV	130.4	107.4
AXIS VelocityStandstillWindow	GSV	36.0	26.0
AXIS VelocityStandstillWindow	SSV	128.7	106.1
AXIS VelocityThreshold	GSV	36.0	26.0
AXIS VelocityThreshold	SSV	128.7	106.1
AXIS VelocityWindow	GSV	36.0	26.0
AXIS VelocityWindow	SSV	128.7	106.1
AXIS WatchPosition	GSV	39.6	28.9
CONTROLLER DataTablePadPercentage	GSV	n/a	19.8
CONTROLLER KeepTestEditsOnSwitchOver	GSV	n/a	12.8
CONTROLLER RedundancyEnabled	GSV	n/a	12.9
CONTROLLER TimeSlice	GSV	24.3	19.8
CONTROLLER TimeSlice	SSV	50.2	43.0
CONTROLLERDEVICE DeviceName	GSV	55.6	48.6
CONTROLLERDEVICE ProductCode	GSV	22.8	19.2
CONTROLLERDEVICE ProductRev	GSV	22.8	19.2
CONTROLLERDEVICE SerialNumber	GSV	24.6	20.7
CONTROLLERDEVICE Status	GSV	22.8	19.2
CONTROLLERDEVICE Type	GSV	22.8	19.2
CONTROLLERDEVICE Vendor	GSV	22.8	19.2
CST CurrentStatus	GSV	21.8	20.1
CST CurrentValue	GSV	36.8	32.2
DF1 ACKTimeout	GSV	24.8	22.0
DF1 DiagnosticCounters	GSV	65.2	53.7
DF1 DuplicateDetection	GSV	14.8	13.5
DF1 EmbeddedResponseEnable	GSV	14.8	13.5
DF1 ENQTransmitLimit	GSV	14.8	13.5
DF1 EOTSuppression	GSV	14.8	13.5
DF1 ErrorDetection	GSV	14.8	13.5
DF1 MasterMessageTransmit	GSV	14.8	13.5
DF1 MaxStationAddress	GSV	14.8	13.5
DF1 NAKReceiveLimit	GSV	14.8	13.5
DF1 NormalPollGroupSize	GSV	23.0	20.5

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
DF1 PendingACKTimeout	SSV	22.4	92.1
DF1 PendingDuplicateDetection	SSV	19.8	90.1
DF1 PendingEmbeddedResponseEnable	SSV	21.7	91.6
DF1 PendingENQTransmitLimit	SSV	21.2	91.2
DF1 PendingEOTSuppression	SSV	21.2	91.2
DF1 PendingErrorDetection	SSV	21.9	91.7
DF1 PendingMasterMessageTransmit	SSV	21.7	91.6
DF1 PendingMaxStationAddress	SSV	21.6	91.6
DF1 PendingNAKReceiveLimit	SSV	21.2	91.2
DF1 PendingNormalPollGroupSize	SSV	21.8	91.8
DF1 PendingPollingMode	SSV	21.6	91.6
DF1 PendingReplyMessageWait	SSV	22.4	92.2
DF1 PendingSlavePollTimeout	SSV	22.4	92.1
DF1 PendingStationAddress	SSV	22.1	92.0
DF1 PendingTokenHoldFactor	SSV	104.9	91.4
DF1 PendingTransmitRetries	SSV	21.2	91.2
DF1 PollingMode	GSV	14.8	13.5
DF1 ReplyMessageWait	GSV	24.8	22.0
DF1 SlavePollTimeout	GSV	24.8	22.0
DF1 StationAddress	GSV	23.0	20.5
DF1 TokenHoldFactor	GSV	14.8	13.5
DF1 TransmitRetries	GSV	14.8	13.5
FAULTLOG MajorEvents	GSV	24.1	19.7
FAULTLOG MajorEvents	SSV	15.2	21.2
FAULTLOG MajorFaultBits	GSV	25.8	21.2
FAULTLOG MajorFaultBits	SSV	15.9	21.6
FAULTLOG MinorEvents	GSV	24.1	19.7
FAULTLOG MinorEvents	SSV	15.2	21.2
FAULTLOG MinorFaultBits	GSV	25.8	21.2
FAULTLOG MinorFaultBits	SSV	15.9	21.6
MESSAGE ConnectionPath	GSV	54.4	41.2
MESSAGE ConnectionPath	SSV	19.2	24.8
MESSAGE ConnectionRate	GSV	25.7	21.0
MESSAGE ConnectionRate	SSV	14.6	20.7
MESSAGE MessageType	GSV	15.7	12.5

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
MESSAGE MessageType	SSV	66.2	57.6
MESSAGE Port	GSV	15.7	12.5
MESSAGE Port	SSV	27.7	30.0
MESSAGE TimeoutMultiplier	GSV	15.7	12.5
MESSAGE TimeoutMultiplier	SSV	13.3	19.7
MESSAGE UnconnectedTimeout	GSV	25.7	20.9
MESSAGE UnconnectedTimeout	SSV	14.6	20.7
MODULE EntryStatus	GSV	23.8	20.0
MODULE FaultCode	GSV	23.8	20.1
MODULE FaultInfo	GSV	25.5	21.5
MODULE ForceStatus	GSV	17.7	14.8
MODULE Instance	GSV	18.4	15.5
MODULE LEDStatus	GSV	17.2	14.4
MODULE Mode	GSV	24.7	20.7
MODULE Mode	SSV	14.2	20.4
MOTIONGROUP AutoTagUpdate	GSV	17.5	13.7
MOTIONGROUP AutoTagUpdate	SSV	16.0	21.6
MOTIONGROUP Instance	GSV	27.2	19.8
MOTIONGROUP MaximumInterval	GSV	34.2	27.7
MOTIONGROUP MaximumInterval	SSV	27.2	30.9
MOTIONGROUP MinimumInterval	GSV	34.2	27.7
MOTIONGROUP StartTime	GSV	34.2	27.7
MOTIONGROUP TaskLastScanTime	GSV	28.0	22.5
MOTIONGROUP TaskMaximumScanTime	GSV	28.0	22.5
MOTIONGROUP TaskMaximumScanTime	SSV	17.3	22.6
MOTIONGROUP Watchdog	GSV	28.0	22.5
MOTIONGROUP Watchdog	SSV	17.3	22.7
PROGRAM DisableFlag	GSV	16.4	13.5
PROGRAM DisableFlag	SSV	34.5	35.5
PROGRAM Instance	GSV	18.8	15.6
PROGRAM LastScanTime	GSV	25.9	21.7
PROGRAM LastScanTime	SSV	16.2	21.9
PROGRAM MajorFaultRecord	GSV	70.8	60.1
PROGRAM MajorFaultRecord	SSV	47.3	47.6
PROGRAM MaxScanTime	GSV	25.9	21.7

Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
PROGRAM MaxScanTime	SSV	16.2	21.9
PROGRAM MinorFaultRecord	GSV	70.8	60.1
PROGRAM MinorFaultRecord	SSV	47.3	47.6
PROGRAM SFCRestart	GSV	17.0	14.1
PROGRAM SFCRestart	SSV	30.5	32.1
REDUNDANCY MaxDataTransferSize	GSV	n/a	21.6
ROUTINE Instance	GSV	17.8	15.7
SERIALPORT BaudRate	GSV	24.9	20.3
SERIALPORT DataBits	GSV	15.0	11.9
SERIALPORT Parity	GSV	15.0	11.9
SERIALPORT PendingBaudRate	SSV	103.6	90.0
SERIALPORT PendingDataBits	SSV	103.6	90.0
SERIALPORT PendingParity	SSV	20.3	90.0
SERIALPORT PendingRTSOffDelay	SSV	20.5	90.2
SERIALPORT PendingRTSSendDelay	SSV	20.8	90.5
SERIALPORT PendingStopBits	SSV	103.6	90.0
SERIALPORT RTSOffDelay	GSV	23.2	18.9
SERIALPORT RTSSendDelay	GSV	23.2	18.9
SERIALPORT StopBits	GSV	15.0	11.9
TASK Instance	GSV	19.0	15.4
TASK LastScanTime	GSV	26.0	21.4
TASK LastScanTime	SSV	15.9	21.7
TASK MaxInterval	GSV	32.0	26.4
TASK MaxInterval	SSV	22.3	27.1
TASK MaxScanTime	GSV	26.0	21.4
TASK MaxScanTime	SSV	15.9	21.7
TASK MinInterval	GSV	32.0	26.4
TASK MinInterval	SSV	22.3	27.1
TASK Priority	GSV	24.3	19.9
TASK Rate	GSV	26.1	21.4
TASK StartTime	GSV	31.9	26.4
TASK StartTime	SSV	22.3	27.1
TASK Watchdog	GSV	26.0	21.4
TASK Watchdog	SSV	30.7	32.2
WALLCLOCKTIME CSTOffset	GSV	31.1	24.7

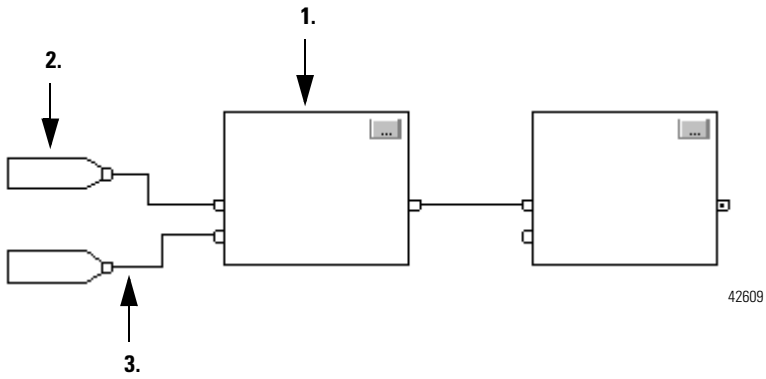
Table B.3 Execution Times for the GSV and SSVInstructions (Continued)

Object/Attribute:	Instruction:	True Time (µs):	
		1756-L1, -L1MX	1756-L55MXX
WALLCLOCKTIME CSTOffset	SSV	1764.2	1257.4
WALLCLOCKTIME CurrentValue	GSV	42.9	33.3
WALLCLOCKTIME CurrentValue	SSV	67.4	59.2
WALLCLOCKTIME DateTime	GSV	72.2	57.0
WALLCLOCKTIME DateTime	SSV	117.6	100.7

Table B.4 Array Index Times

For a tag in the subscript of a:	Add (µs):
one dimension array	1.5
two dimension array	22
three dimension array	27

Estimate Execution Time of a Function Block Routine



1. For each function block instruction, add the time from Table B.5 on page B-24.

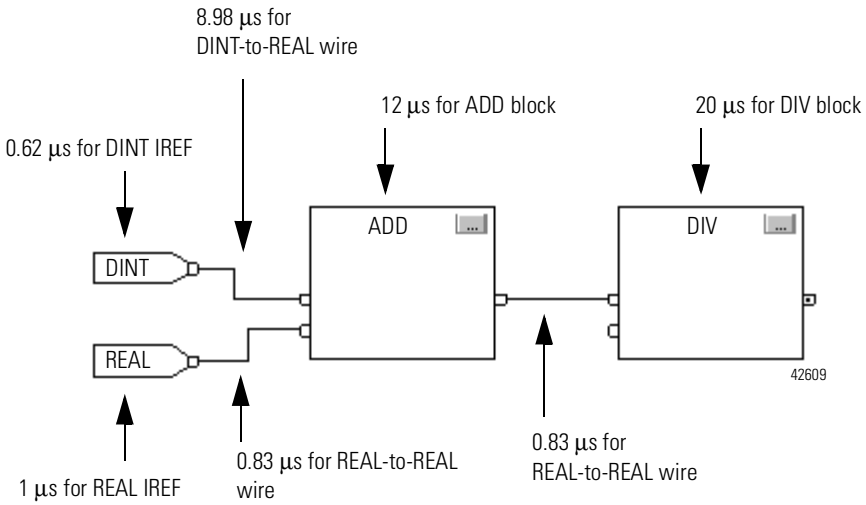
2. For each IREF and OREF, add the following time. (Skip any immediate values.)

For an:	With a data type of:	Add (µs):	
		1756-L1, -L1Mx	1756-L55Mx
IREF	BOOL	0.56	0.55
	DINT	0.62	0.60
	REAL	1.00	0.96
OREF	BOOL	0.16	0.16
	DINT	0.16	0.16
	REAL	0.16	0.15

3. For each wire, add the following time:

If the wire connects a:	Add (µs):	
	1756-L1, -L1Mx	1756-L55Mx
BOOL-to-BOOL	0.40	0.39
DINT-to-DINT	0.46	0.45
DINT-to-REAL	8.98	7.32
REAL-to-DINT	13.26	10.59
REAL-to-REAL	0.83	0.81

EXAMPLE Estimate the execution time of a function block routine for a 1756-L1 controller



For each function block instruction, add the following time:

Table B.5 Execution Times for Function Block Instructions

Instruction:	Time (µs):		Notes:
	1756-L1, -L1Mx	1756-L55Mx	
ABS	2	2	
ACS	273	251	
ADD	12	11	
ALM	105	72	
AND	1	1	
ASN	264	243	
ATN	226	214	
BAND	9	8	
BNOT	10	8	
BOR	10	9	
BTDT	14	12	
BXOR	9	8	
COS	224	209	
CTUD	29	14	

Table B.5 Execution Times for Function Block Instructions (Continued)

Instruction:	Time (µs):		Notes:
	1756-L1, -L1Mx	1756-L55Mx	
D2SD	78	60	
D3SD	96	73	
DEDT	113	80	
DEG	20	19	
DERV	104	68	
DFF	12	10	
DIV	20	19	
EQU	2	2	
ESEL-Average Sel.	85	62	
ESEL-High Select	71	53	
ESEL-Low Select	80	60	
ESEL-Manual	34	29	
ESEL-Median Sel.	138	103	
FGEN	142	97	
FRD	10	8	
GEQ	2	2	
GRT	2	2	
HLL	24	19	
HPF	302	196	
INTG	104	72	
JKFF	14	11	
LDL2	283	193	
LDLG	222	141	
LEQ	2	2	
LES	2	2	
LIM	5	4	
LN	194	182	
LOG	194	183	
LPF	298	193	
MAVE (uniform)	61 + (x * 16.3)	49 + (x * 9.7)	x = number of samples
MAVE (weighted)	46 + (x * 11.5)	38 + (x * 7.1)	x = number of samples
MAXC	23	22	
MEQ	2	2	

Table B.5 Execution Times for Function Block Instructions (Continued)

Instruction:	Time (µs):		Notes:
	1756-L1, -L1Mx	1756-L55Mx	
MINC	24	23	
MOD	65	58	
MSTD	136 + (x * 49.0)	91 + (x * 28.8)	x = number of samples
MUL	19	18	
MUX	24	21	
MVMT	13	11	
NEG	2	2	
NEQ	2	2	
NOT	1	1	
NTCH	357	236	
OR	1	1	
OSFI	13	9	
OSRI	12	9	
PI	190	133	
PIDE	589	410	
PMUL	135	86	
POSP	136	88	
RAD	19	18	
RESD	10	11	
RLIM	96	72	
RMPS	163	111	
RTOR	57	37	
SCL	63	41	
SCRV	268	178	
SEL	15	13	
SETD	10	10	
SIN	230	215	
SNEG	16	14	
SOC	239	168	
SQR	39	29	
SRTP	155	100	
SSUM	32 + (x * 28.9)	25 + (x * 17.2)	x = number of samples
SUB	12	11	

Table B.5 Execution Times for Function Block Instructions (Continued)

Instruction:	Time (µs):		Notes:
	1756-L1, -L1Mx	1756-L55Mx	
TAN	291	273	
TOD	16	12	
TOFR	48	35	
TONR	52	35	
TOT	118	83	
TRN	14	11	
UPDN	27	20	
XOR	2	1	
XPY	401	374	

Estimate Execution Time of a Motion Action

Use the following table to determine the time required for the controller to execute various motion actions.

Table B.6 Execution Times for Motion Actions

Motion state or action (Δ = per axis)		Logix5550 average execution time (μs)	Logix5555 average execution time (μs)
motion task overhead		233	131
servo axis Δ		179	115
virtual axis Δ		172	105
consumed axis Δ		896[1]	573[1]
auto tag update	AXIS_SERVO data type	197	114
	AXIS_SERVO_DRIVE data type		
	AXIS_VIRTUAL data type		
	AXIS_CONSUMED data type	108	79
servo on Δ		33	19
trap move Δ		230	135
S-curve move Δ		358	213
trap jog Δ		220	124
S-curve jog Δ		328	197
gearing	actual Δ	266	158
	clutch Δ	166	72
gearing	command Δ	83	65
	clutch Δ	138	76
position camming (actual, linear) Δ		441	239
position camming (actual, cubic) Δ		531	302
position camming (command, linear) Δ		232	144
position camming (command, cubic) Δ		356	210
time camming (linear) Δ		180	117
time camming (cubic) Δ		287	167

(1) This value is worst case (producer/consumer update ratio = 2/3). To reduce the time by 25%, use a consumer coarse update period that is an integer multiple of the producer coarse update period (e.g., 2/4).

Estimate Memory Use

Using This Appendix

Use this appendix to calculate the memory used for data conversions, instructions, and array indexes. Values are for ControlLogix controllers (Cat. No. 1756-L1, -L1Mx, -L55Mxx) and RSLogix 5000™ software.

TIP

When you download your project, the controller optimizes memory use, which could reduce your calculated memory use by as much as 10% from the values presented in this appendix.

To calculate the memory for:	See page:
Data Conversions	C-1
Ladder Instructions	C-3
Function Block Instructions	C-7
Array Indexes	C-9

Data Conversions

If you use a data type that is not an optimal data type or if you mix data types, you must add memory for data conversion.

Sign-Extension Memory Requirements

Use the following table to determine the memory required to convert data by sign-extension.

Table C.1 Memory Size of a Conversion by Sign-Extension

To convert a:	From a:	To a:	Add (bytes):
Source operand	SINT	DINT	48
		REAL	120
	INT	DINT	60
		REAL	132
	DINT	REAL	76
Destination operand	DINT	SINT	52
		INT	52
		REAL	76
	REAL	SINT	72
		INT	72
		DINT	72

Zero-Fill Memory Requirements

Use the following table to determine the memory required to convert data by zero-fill.

Table C.2 Memory Size of a Conversion by Zero-Fill

To convert a:	From a:	To a:	Add (bytes):
Source operand	SINT	DINT	0
	INT	DINT	8
Destination operand	DINT	SINT	88
		INT	100

Examples:

Instruction:	Data Type:	Memory (bytes):
ADD	REAL	44 bytes for the ADD instruction
Source A	DINT	76 bytes for DINT to REAL conversion by sign-extension
Source B	REAL	
Destination	REAL	
		120 bytes total
MUL	REAL	44 bytes for MUL instruction
Source A	REAL	
Source B	DINT	76 bytes for DINT to REAL conversion by sign-extension
Destination	DINT	76 bytes for REAL to DINT conversion by sign-extension
		192 bytes total

Ladder Instructions

The following table shows the memory use of the ladder instructions. For those instructions that use an expression (CMP, CPT, FAL, FSC), add memory for each operation within the expression. For each operation, use the value for the corresponding instruction.

Example:

Instruction:	Data Type:	Memory:
CMP (*tag_a * tag_b / 100)*		76 bytes overhead
* (MUL)	REAL	44 bytes for the MUL operation
/ (DIV)	REAL	44 bytes for the DIV operation
		164 bytes total

Table C.3 Memory Size of Ladder Instructions

Instruction:	Memory for DINT (bytes):	Memory for REAL (bytes):
ABL	52	
ABL	52	
ABS	32	56
ABS	32	56
ACB	52	
ACB	52	
ACL	64	

Table C.3 Memory Size of Ladder Instructions (Continued)

Instruction:	Memory for DINT (bytes):	Memory for REAL (bytes):
ACL	64	
ACS	140	48
ACS	140	48
ADD	28	44
ADD	28	44
AFI	4	
AHL	68	
AND	28	
ARD	76	
ARL	76	
ASN	140	48
ATN	140	48
AVE	164	116
AWA	80	
AWT	80	
BRK	44	
BSL	52	
BSR	52	
BTD	52	
CLR	20	20
CMP	76	76
CONCAT	116	
COP	64	64
COS	140	48
CPS	64	64
CPT	76	96
CTD	8	
CTU	8	
DDT	72	
DEG	144	52
DELETE	108	
DIV	44	44
DTOS	72	
DTR	40	
EQU	20	20
FAL	92	116

Table C.3 Memory Size of Ladder Instructions (Continued)

Instruction:	Memory for DINT (bytes):	Memory for REAL (bytes):
FBC	72	
FFL	64	64
FFU	64	64
FIND	108	
FLL	60	60
FOR	64	
FRD	40	
FSC	148	152
GEQ	20	36
GRT	20	36
GSV	84	84
INSERT	124	
JMP	24	
JSR	56	
LBL	12	
LEQ	20	36
LES	20	36
LFL	64	64
LFU	64	64
LIM	52	44
LN	140	48
LOG	140	48
LOWER	88	
MAAT	56	
MAFR	56	
MAG	216	172
MAH	56	
MAHD	72	
MAJ	256	116
MAM	308	124
MAOC	480	
MAPC	168	
MAR	192	96
MAS	136	84
MASD	56	
MASR	56	

Table C.3 Memory Size of Ladder Instructions (Continued)

Instruction:	Memory for DINT (bytes):	Memory for REAL (bytes):
MATC	124	
MAW	124	72
MCCP	180	
MCD	236	96
MCR	4	
MDF	56	
MDO	124	72
MDOC	120	
MDR	64	
MDW	56	
MEQ	32	
MGPS	60	
MGS	60	
MGSD	52	
MGSP	52	
MGSR	52	
MID	108	
MOD	44	44
MOV	24	48
MRAT	56	
MRHD	64	
MRP	124	72
MSF	56	
MSG	36	
MSO	56	
MUL	44	44
MVM	44	
NEG	28	56
NEQ	20	20
NOP	4	
NOT	28	
ONS	36	
OR	28	
OSF	44	
OSR	44	
OTE	4	

Table C.3 Memory Size of Ladder Instructions (Continued)

Instruction:	Memory for DINT (bytes):	Memory for REAL (bytes):
OTL	4	
OTU	4	
PID	228	92
RAD	144	52
RES	8	
RET	40	
RTO	8	
RTOS	72	
SBR	40	
SIN	140	48
SIZE	124	
SOR - EOR (empty rung)	16	
SQI	48	
SQL	48	
SQO	44	
SQR	40	40
SRT	108	108
SSV	84	84
STD	104	
STOD	72	
STOR	72	
SUB	28	44
SWPB	72	
TAN	140	48
TND	12	
TOD	40	
TOF	8	
TON	8	
TRN	40	92
UID	36	
UIE	36	
UPPER	88	
XIC	4	
XIO	4	
XOR	28	
XPY	144	52

Function Block Instructions

The following table shows the memory use of the function block instructions.

Table C.4 Memory Size of Function Block Instructions

Instruction:	Memory (bytes):
blank sheet	84
ALM	204
BAND	188
BNOT	176
BOR	188
BXOR	180
CTUD	204
D2SD	300
D3SD	344
DEDT	296
DERV	184
DFF	188
ESEL	248
FGEN	204
HLL	196
HPF	172
INTG	172
JKFF	188
LDL2	172
LDLG	172
LPF	172
MAVE	216
MAXC	188
MINC	188
MSTD	216
MUX	208
NTCH	172
OSFI	184
OSRI	184
PI	168
PIDE	348
PMUL	188
POSP	208
RESD	184

Table C.4 Memory Size of Function Block Instructions (Continued)

Instruction:	Memory (bytes):
RLIM	184
RMPS	324
RTOR	196
SCL	168
SCRV	172
SEL	192
SETD	184
SNEG	188
SOC	168
SRTP	168
SSUM	204
TOFR	196
TONR	200
TOT	264
UPDN	176

Array Indexes

Memory use for an instruction increases for each parameter that references an array. Keep in mind these considerations:

1. When an array uses immediate values for the index, there is no additional memory added.

Example:	Tag:	Memory:
MOV instruction		24 bytes
Source	DINT	
Destination	DINT	
MOV instruction		24 bytes
Source	DINT	
Destination	DINT[0]	
MOV instruction		24 bytes
Source	DINT[0,1,2]	
Destination	DINT[3,4,5]	

2. When an array uses a tag (type DINT) as an index, additional memory is used, depending on the number of dimensions in the array.

Tag:	Additional Memory:
DINT[DINT]	84 bytes
DINT[DINT,0]	152 bytes
DINT[0,DINT,0]	152 bytes

For example:

Example:	Tag:	Memory:
MOV instruction		108 bytes
Source	DINT	
Destination	DINT[DINT]	
MOV instruction		176 bytes
Source	DINT	
Destination	DINT[DINT,0,0]	

3. The controller uses a 32-bit index for all arrays. If you use a tag other than DINT to reference a position in an array, you add the data conversion memory use (see page C-1) as well as the memory use for using a tag as an index.

Example:	Tag:	Memory:
MOV instruction		168 bytes
Source	DINT	
Destination	DINT[INT]	
MOV instruction		236 bytes
Source	DINT	
Destination	DINT[INT,0,0]	

4. Changing the source and destination data type in the above examples, increases the instruction's memory use.

Example:	Tag:	Memory:
MOV instruction		200 bytes
Source	DINT	
Destination	INT[INT]	

Example:	Tag:	Memory:
MOV instruction		240 bytes
Source	SINT	
Destination	INT[INT]	
MOV instruction		268 bytes
Source	DINT	
Destination	SINT[INT,0,0}	
MOV instruction		320 bytes
Source	INT	
Destination	SINT[INT,0,0]	

5. If you use an expression in the index, additional memory is used, depending on the operators.

Example:	Tag:	Memory:
MOV instruction		132 bytes
Source	DINT	
Destination	DINT[DINT + DINT]	

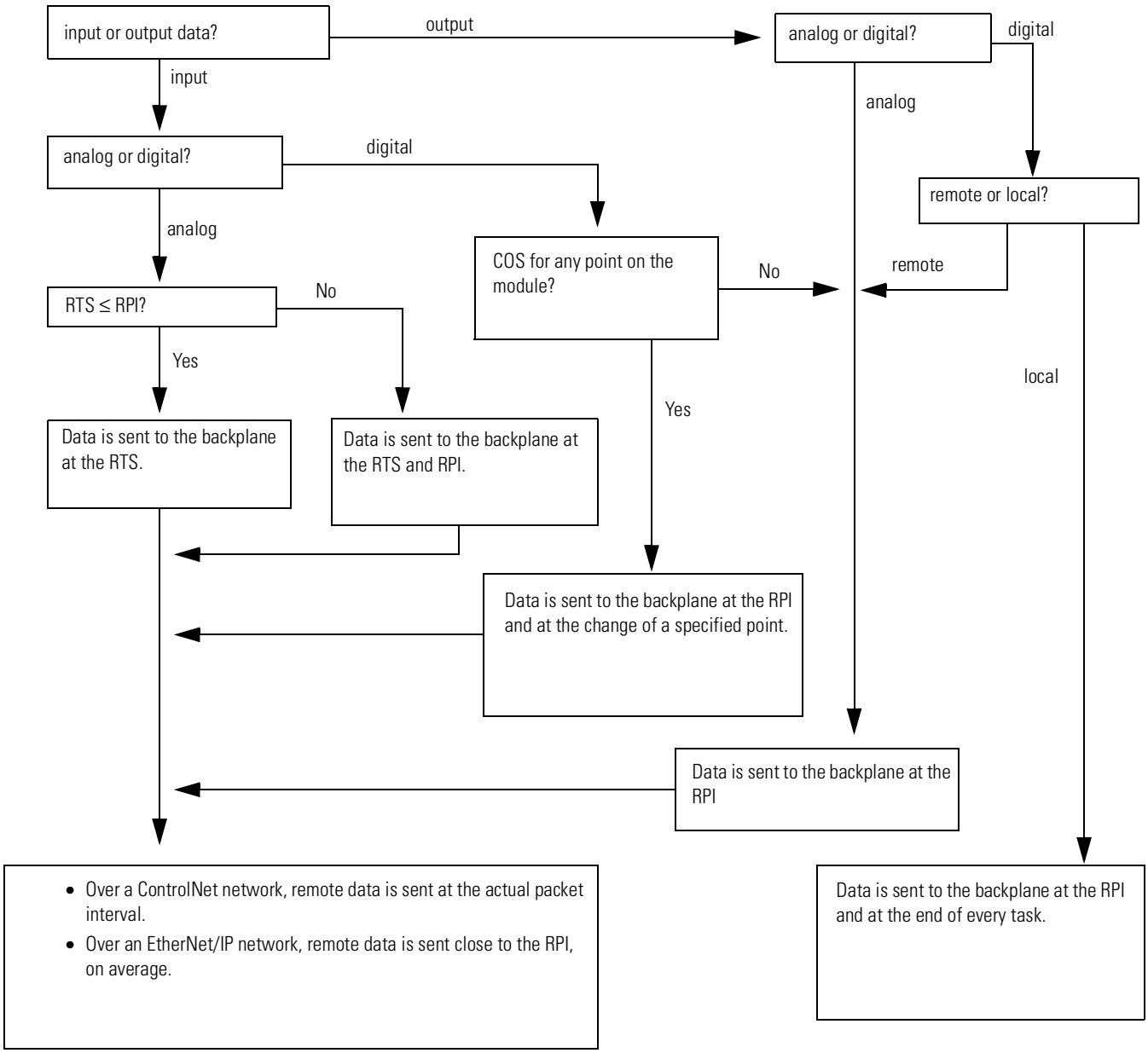
6. If you use multiple arrays in one instructions, add the appropriate memory use for each array reference.

Example:	Tag:	Memory:
MOV instruction		184 bytes
Source	DINT[DINT]	
Destination	DINT[DINT]	
MOV instruction		320 bytes
Source	DINT[DINT, DINT, DINT]	
Destination	DINT[DINT, DINT, DINT}	

Notes:

Determine When Data Is Updated

ControlLogix controllers update date asynchronous with the execution of logic. Use the following flowchart to determine when a producer (controller, input module, or bridge module) will send data.


input or output data?
output
analog or digital?
digital
input
analog
analog or digital?
digital
remote or local?
analog
COS for any point on the module?
No
remote
RTS ≤ RPI?
No
Yes
local
Yes
Data is sent to the backplane at the RTS.
Data is sent to the backplane at the RTS and RPI.
Data is sent to the backplane at the RPI and at the change of a specified point.
Data is sent to the backplane at the RPI
• Over a ControlNet network, remote data is sent at the actual packet interval.
• Over an EtherNet/IP network, remote data is sent close to the RPI, on average.
Data is sent to the backplane at the RPI and at the end of every task.

Notes:

Reconfigure an I/O module

Use the Module Reconfigure message to send new configuration information to an I/O module. During the reconfiguration:

- Input modules continue to send input data to the controller.
- Output modules continue to controller their output devices.

A Module Reconfigure message requires the following configuration properties:

In this property:	Select:
Message Type	Module Reconfigure

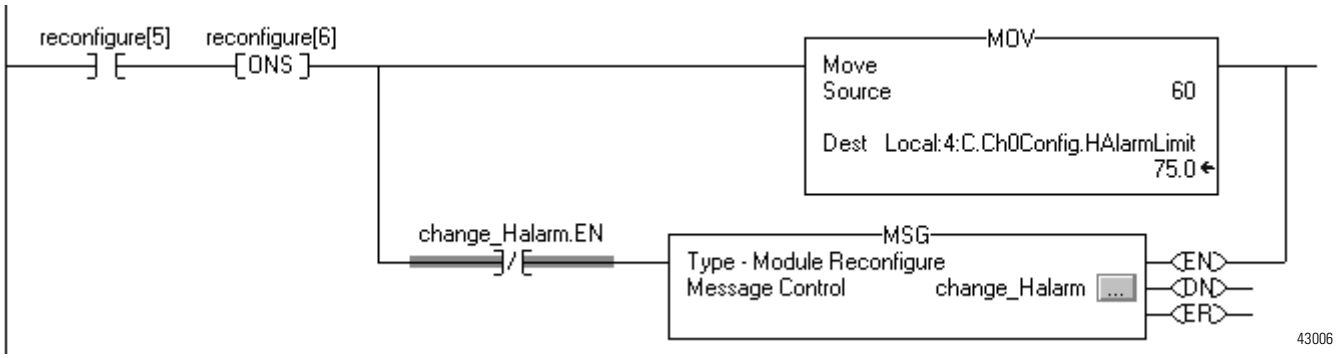
To reconfigure an I/O module:

1. Set the required member of the configuration tag of the module to the new value.

2. Send a Module Reconfigure message to the module.

EXAMPLE Reconfigure an I/O module

When *reconfigure[5]* is on, the MOV instruction sets the high alarm to 60 for the local module in slot 4. The Module Reconfigure message then sends the new alarm value to the module. The ONS instruction prevents the rung from sending multiple messages to the module while the *reconfigure[5]* is on.



Notes:

Numerics

1747 I/O 20-1
1756 I/O 3-1, 8-1
1756-CNB module 8-1, 9-1, 10-1, 11-1, 13-1
1756-DHRIO module 17-1, 18-1, 20-1
1756-ENBx module 1-1, 3-1, 5-1, 7-1
1756-ENET module 1-1, 3-1, 5-1, 7-1
1756-M02AE module 24-1
1756-NET-AIC 19-3
1771 I/O
ControlNet network 9-1
remote I/O network 20-1
1788-CNC module 11-1
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Pub. Title/Type ControlLogix™ System

Cat. No. 1756-L1, -L1Mx, -L55Mxx, -L63 Pub. No. 1756-UM001D-EN-P Pub. Date November 2001 Part No. 957626-25

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Publication 1756-UM001D-EN-P - November 2001 PN 957626-25
Supersedes Publication 1756-UM001C-EN-P - June 2001
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